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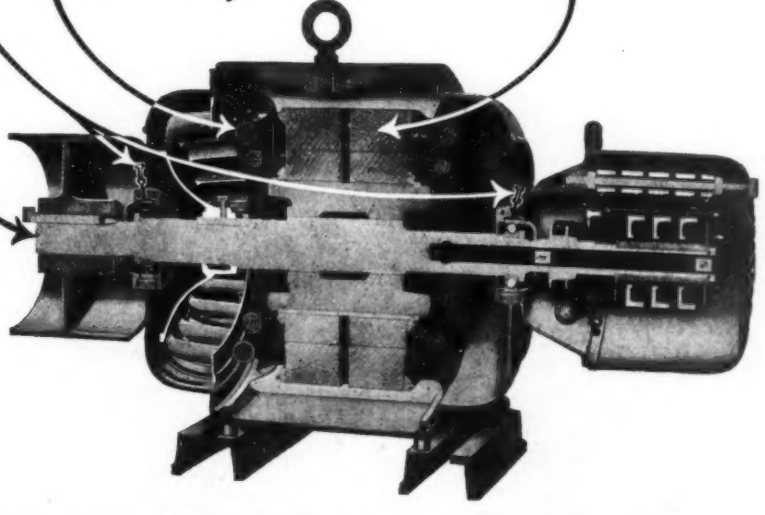

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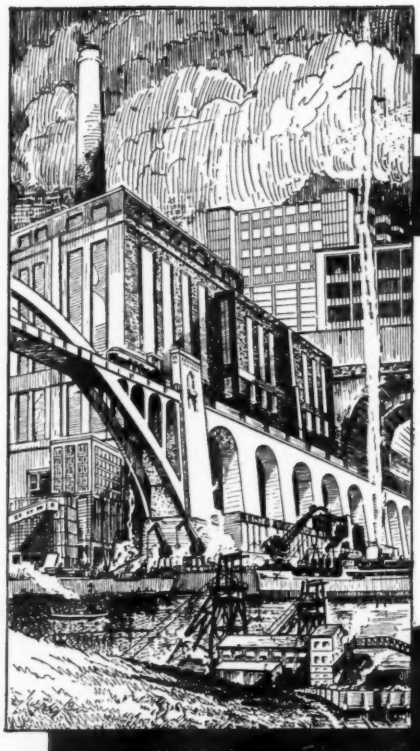
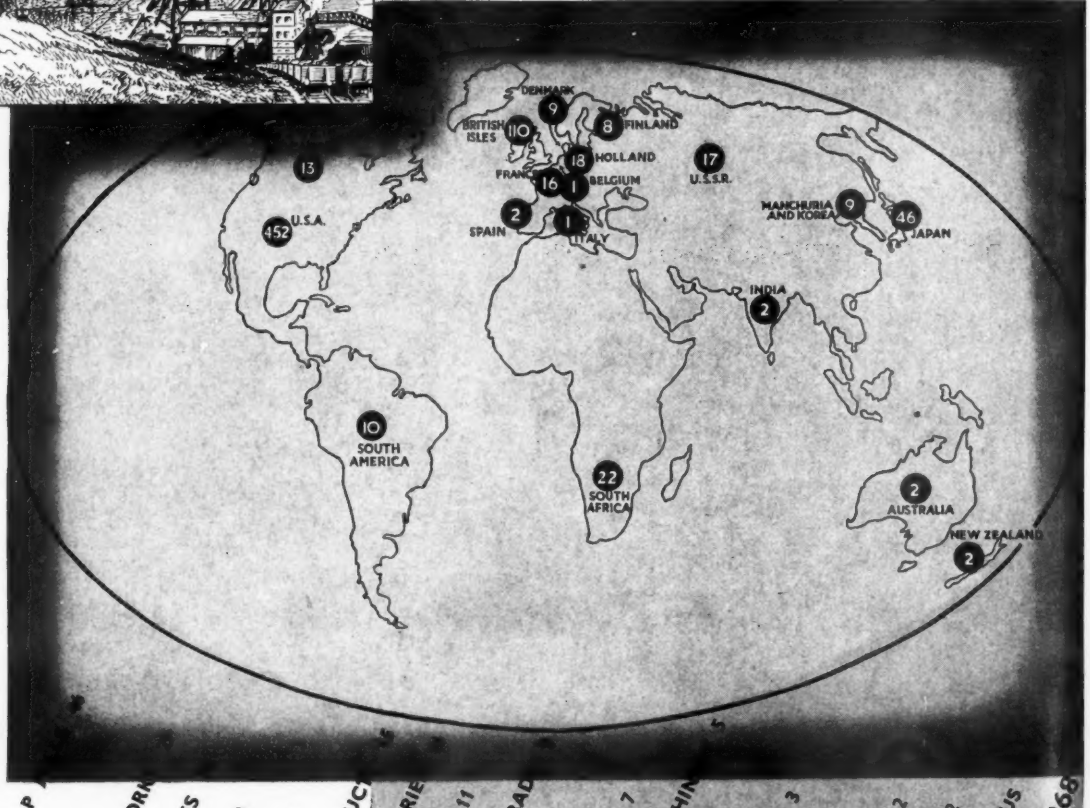


INDUSTRIAL REVIVAL AND THE BAILEY FURNACE

WHEREVER the cost of steam enters appreciably into the overhead of any manufactured product, every step should be taken to make this cost a minimum. To the Power Station the principal raw material is coal, and therefore any saving in coal costs soon amounts to considerable sums. Whilst with industrial plants the amount of the saving is not of the same magnitude, yet frequently the gain in economy materially reduces production costs. The figures given on the map below show the number of Bailey Water Cooled Combustion Chambers installed in each country to the end of April 1934 approximately, which reach a total of 740. Below the map are listed the number of Bailey Furnaces installed in Industrial Plants to the same date, which total 268. It will be seen therefore that 36% of the World Installations of Bailey Furnaces have been installed in Industrial Plants. In order to take full advantage of the Industrial Revival, manufacturers should investigate thoroughly the possibility of reducing steam costs through the installation of modern steam raising units equipped with Bailey Furnaces, or the addition of Bailey Furnaces to existing boiler units. Any Babcock & Wilcox Branch Office, Associated Company, Representative or Agent will furnish full particulars on application without the enquirer being placed under any obligation and without charge.



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The
Electrical Review

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Electricity Supply Policy

A NATIONAL power policy committee has been appointed in the United States. The duties with which it is charged are similar to the obligations which have rested upon leaders in the same department of activity in this country for a number of years, some of which obligations still remain undischarged.

The American committee has to develop a plan for the closer co-operation of the several factors in electric power supply—both public and private—whereby national policy in power matters may be unified and electricity be made more broadly available at cheaper rates to industrial, to domestic, and particularly to agricultural consumers.

The *Electrical World* is far from satisfied with the personnel of the committee. They are stated either to have no association with the electric power business or to be regarded as enemies of the electrical utilities; yet they are, in a large measure, to determine policy affecting a major industry in which millions of citizens have invested over twelve billion dollars.

Our contemporary asks whether there are no competent electrical utility operators, and why the matter should be left to lawyers, foresters and army officers. It answers its own questions by claiming that the States has a large number of men long experienced in the business of electricity supply who could bring seasoned specialised judgment to the deliberations.

In this country we have made better advance toward co-ordination than have electricity interests across the Atlantic, but it is obvious that we have not gone nearly far enough. Many minds are at work concerning our own problems, and the character of the publicity that they are receiving suggests the danger that sooner or later the politicians will seek to provide what they, with inexpert knowledge, regard as a solution.

If there is anything that should be avoided, if we are to secure the maximum electrical development of Britain, it is the dictation of the politicians as such, yet the plain fact of the situation is that unless the industry can unify itself more completely than has so far proved practicable Parliament will take action.

The Roosevelt orders to the American power committee are framed with the idea of securing unified control and operation and availability—that is distribution—to all classes of consumers at cheaper rates. We do not doubt that the situation in the States is a very complex one, but whatever solution—if any—is recommended we may expect it to be sweepingly adopted and carried into effect.

In Britain it is increasingly obvious that notwithstanding all that has been done the unsolved problems are still very great. Probably before long we shall hear something from our electricity supply leaders concerning the steps that are considered necessary in order that the handicaps that block the path of progress—local limitations and so on—may be overcome.

When we have referred to backward undertakings we have known well enough that it has not always been the engineer or manager who has been responsible for delayed development. When we get down to fundamentals we are faced with the great problem of ownership and a certain uniformity of policy, and while we have to be content with a system under which in the multitude of uninitiated Councillors there is confusion we cannot expect to secure our great electrical objective.

American Visitors

Two representatives of the Tennessee Valley Authority, to whose operations reference has already been made in our pages, have come across the Atlantic to study the grid system. They are Mr. David E. Lilienthal, the director and administrative assistant, and Mr. Llewellyn Evans, the chief electrical engineer to the Authority. As special distribution developments lie ahead of them in the States, they are naturally anxious to be intimately informed regarding the most up-to-date practice as embodied in our transmission and distribution system. Their first visit on this side was made early this week to the Shannon River power undertaking, but their main object seems to be to gather all the information that is available

in this country regarding the provision of electric power to local authorities and its distribution to the public. That they will have a cordial welcome from the Board and the Commissioners we have no doubt, and we hope that they will depart much the wiser for their study of what British engineers and manufacturers have planned and so far accomplished. Though perhaps it may have no direct relation to their inquiry, we are somehow or other led to recall to the minds of some of our leaders the occasions, while the British grid was either in process of birth or in the stage of early nourishment, when the utility experience of another American visitor, Mr. Samuel Insull, of Chicago, was found helpful at Westminster. Mr. Insull still continues under the shadow of the trial which he is to undergo at Chicago next month, but those who know the story of his early and remarkable work in the expansion of electricity production and consumption in the States will remember that it was the envy of students of such matters here. He is undoubtedly a man of "seasoned specialised judgment" such as our contemporary already quoted regards as essential for determining future policy in the States, but circumstances have deprived the American people of his experience and of that of his associates.

The Engineer's Handicap

THOUGH the holiday season is at its height, and local government continues without meetings and speeches for a while, plans for new electricity supply efforts must not wait. Between September and Christmas there will be very busy times for campaigns, whether conducted centrally or locally. Engineers and managers probably appreciate the inactivity at the Town Hall, and after their own vacation proceed with plans for the approval of returned councillors. Unfortunately, where committees and councils are unable to see things as the engineer sees them, the latter has to submit to the frustration of his plans for greater advance. He has, perhaps, been living in anxiety, eager that his undertaking shall not be numbered among the "down and outs," and it is important to him that he shall secure the full co-operation of his employers. Slowing up in development is sometimes due to the system which arms with authority men who either do not recognise their obligations to place electrical facilities within reach of all their constituents or ratepayers, or who whittle down or ignore their responsibilities. Have they not so many other local matters to think about besides the interests of electricity supply? Of course, this is not a new criticism, nor is it intended to rob the large number of corporations and committees that have such excellent records of the credit that is due to them. But it is obvious that in plans for future development something will have to be contrived in order that this weakness may be removed.

Radio Reflections

THE Radio Exhibition at Olympia, which closes to-morrow, has a more definitely all-British aspect than any of its predecessors. Technical surprises were not anticipated, but a good deal of quiet development, especially by valve makers, has been taking place. The tendency for receiver design to be governed by valve type is becoming apparent, and is an aspect that needs watching. One of the most recent advances has been the production of universal valves, which enable a set to work equally well off a.c. or d.c. mains, thus solving one of the electricity supplier's many problems and reducing his compensation liability during change-overs of systems. The preponderance of a.c. mains sets is even more striking than last year. The popularity of the super-heterodyne circuit is amply demonstrated, and very few manufacturers now offer "straight" sets. Portable receivers have been improved out of all recognition, and some of them are capable of really good performance. The provision of built-in coils and automatic volume control, expressly intended to minimise high-speed fading with mains operation as the rule rather than the exception, are the chief changes in short-wave receivers, which, though of increasing importance, form a small proportion of the total exhibits. Motor-car radio sets are a small minority also, and television equipment is to be seen on one or two stands only.

Improved Quality

THE tendency to offer better quality of reproduction, which is a notable feature of this year's show, is gratifying. Good quality amplifiers and loudspeakers are more prominent than they have been before, with a wider and lower-priced range to choose from. Several set makers employ dual speakers, and one radio-gramophone maker actually provides three, two cones and a trumpet. Apart from automatic record-changing mechanism, an electric gramophone is now available with two pick-ups, one for each side of the record, and more than one manufacturer has adopted the piezo-electric pick-up principle. Prices are, on the whole, moderate, and it is encouraging to see chassis endurance and life tests being conducted publicly at an exhibition. A welcome indication of the trend of demand is the amount of set testing and servicing equipment displayed on several stands.

The Overseas Trade Position

JUST before Parliament rose for the summer recess the President of the Board of Trade was asked what steps the Government proposed to take to deal with the considerable rise that had taken place in electrical imports during the first three months of the year. Dr. Burgin, the Parliamentary Secretary, replied that if the industries affected considered that additional protection was necessary they should make representations to the Imports Duty Advisory Committee. The latest figures available (those for July, which are reviewed on another page) show that imports continue to move rapidly upwards, although they are still well below the average for the years immediately preceding the introduction of import duties in 1932. The exports, although they too are higher, have not risen to the same extent, and as compared with the average of the past ten years make a poor showing. If trade is really reviving we do not want to see the import trade reaping too much of the benefit.

The B.A. at Aberdeen

ENGINEERS who attend the meeting of the British Association at Aberdeen are to be afforded an opportunity, after the completion of the sectional proceedings, of visiting the power-plant and other works of the Grampian Electricity Supply Company. This will be an appropriate round-off to meetings of the Engineering Section, the president of which, Professor F. G. Baily, has chosen "Sources of Cheap Electrical Power" as the subject for his inaugural address. Nearly fifty years have passed since the Association last met in Aberdeen. Sir James Jeans will deliver the opening address on September 5th, and modern physics is to be his theme.

Jobs Wanting Men

WHILE we do not wish to mislead our readers by attaching more importance than is justifiable to the recent indications of improving electrical trade and better prospects for employment, we think that the recent lengthening of our list of "Situations Vacant" and "Official Notices" of appointments that are open affords grounds for encouragement. Past experience has led us to attach significance to this tendency as a good all-round sign, and for the sake of readers who are scanning these advertisements so eagerly from week to week just now we hope that our expectation will be realised, and that there will be no setback. At this period of the year, when plans for new business of various kinds are being made by companies, undertakings and firms, there should be more jobs going than for some time past. May both home development and export demands continue to grow, providing professional men and artisans alike with work.

The Olympia Exhibition. By Radio Expert

A critical review of apparatus and policy

IT is apparent that this year's Radio Exhibition has been a success; the attendance figures have been remarkably high. Since there is every prospect that the current revival in trade and industry will shortly bring increased purchasing power to the private individual, it seems almost certain that the show will result in large sales. It is therefore even more interesting than usual to try and gauge the trend of design and trade policy. In any such attempt the personal element cannot be ignored, and it is therefore pertinent to note that as a music-lover, engineer, and technical writer, I have lived on broadcasting for the last twelve years.

On the whole, the most notable feature of this show is its clear indication that "home construction" is dying; to all intents and purposes it is already dead. The firms who used to thrive on making components for amateur use are now either defunct, or have become set-makers, or live by selling components in bulk to the set-maker: they may still advertise to the amateur, but they cannot live by him. True, there is, and will always remain, a minority of fairly capable people who build their own sets as a serious hobby; but that great spate of dabblers who blindly followed detailed instructions and ill-built sets of poor design has been stemmed.

The "home constructor" has been killed by overwork. A mutual advantage arrangement between the cheaper radio journals and the component manufacturers led to ruthless exploitation by a steady stream of new sets: each supposed to render all others obsolete and ensure the purchase of new components; all having resounding names and a host of worthless "stunts" and so-called improvements; and not one in a hundred a really good design.

Range and Reproduction

Now at last the public is beginning to realise that it can save money by buying its sets. This in turn has led to great "push" by the set-makers. It is most encouraging to realise that these manufacturers see signs that the purchaser is gradually beginning to demand a good musical quality. Accordingly the set-makers have made a great step forward: they are all advertising that their sets give perfect reproduction. This is as far as most of them care to go at present; I could find few attempts to actually provide good reproduction, but it is a good sign that manufacturers think it worth while even to claim it.

The first essential in the design of a commercial set is still evidently that it shall receive many stations. In order to get these free of interference the band-width accepted is cut to about 4 kc/s, with complete loss of all the real tone-colour of the higher notes. There is at least one exception, a smallish firm, which states outright that its apparatus is designed to receive British broadcasting, and shows actual response curves going right up to 10,000 c/s and beyond.

It is evident that the "mass-production" manufacturers have a fairly low opinion of their customers. Very probably their view is correct; but none the less I cannot help feeling somewhat nauseated by the nature of their appeal in some cases. Elaborate and magnificent stand decorations having no connection with the material shown are very common: often one finds a stand infested by oddly-dressed females chosen for their physical attractions. More common still is the frantic search for high-sounding names which mean exactly nothing. It may be true that the public cannot be induced to buy without this "ballyhoo" business, but I doubt it.

Reasons for Poor Quality

Admittedly, one cannot claim to have proved that this year's sets have poor audio quality, because one has not heard them. But the vast majority have three features that make good quality rather unlikely. First, the top notes are restricted, as already noted. Secondly, in most cases pentode output valves are used and as these usually generate a minimum of 7 to 8 per cent. harmonics at the low output of 2 watts or so, undistorted output at good volume is a physical impossibility. Thirdly, apparently in even the expensive sets the manufacturer will not pay a good price for a good loud-speaker.

It seems that the tendency is to advertise "perfect reproduction," but in practice to bank on the fact that the great majority of purchasers have been brought up on "canned" music and do not know what the real thing sounds like.

A general view of the exhibition—a bright and well-arranged display

An interesting point is that, though there is some beautiful cabinet-work and a wonderful ingenuity in control devices, most of the sets are much alike in circuit design. This seems to be due to the growing dependence on circuits and data supplied by the valve-makers in order to encourage the adoption of their new types. As regards practical results this is probably advantageous, but it seems rather a bad thing in the long run, for it must tend towards the restriction of independent development and research work.

This year it has resulted in an enormous preponderance of sets using the supersonic principle with very few valves—usually four. It is very doubtful whether this is really a sound design at all: but from the valve-maker's point of view it has the advantage that the set is built round one definite series of valves, so that replacements must come from the same maker.

Perhaps this tendency accounts for one rather surprising thing—the almost complete neglect of the Radio Research Board's report on designs in which circuits of high selectivity (giving severe loss of high notes) are followed by compensating circuits in the audio-frequency amplifier to bring back correct overall frequency response. It was shown in the report that this system has undoubted advantages in cutting down modulation interference. Whereas (with transmitters spaced 9 kc/s apart in the wave-band) tuning by many band-pass circuits necessarily involves loss of everything above 4,000 c/s or so, the tone-correction system will in many circumstances allow

an extension to 6,000 or even 7,000 c/s before interference becomes a nuisance. Such circuits indeed call for considerable skill in design, which may account for the fact that only two exhibitors appear to be using them.

The Demonstration Problem

One difficulty which still awaits solution is that of demonstration. This year, as last, a central amplifier is provided, from which any exhibitor can take the fare provided. This consists mostly of gramophone records by day, with excerpts from the variety show in the evening. The power available for each stand is (on the average) 200 to 500 mW. It is forbidden to amplify it in any way, and also forbidden to take premises outside the exhibition wherein proper demonstrations can be given. This, of course, is farcical. The maker of a 100-guinea "super" set, guaranteed to receive 256 stations with perfect reproduction, can offer no proof; and the unfortunate firms that offer high-powered loud-speakers are often made ridiculous. Of course, the makers of cheap stuff are thoroughly happy: they will not get such good results again!

A "close-up" of the novel and ingenious centrepiece

It is not, of course, easy at first sight to find a way of letting each exhibitor demonstrate as he chooses, without a host of complaints from other exhibitors: but it is by no means impossible. It is suggested that the R.M.A. appoint a permanent sub-committee to consult with exhibitors and arrange a reasonable scheme for next year's show. If they do not, they will certainly lose several valuable exhibitors, for the few firms who offer reproduction above the average will not continue to support a show where they cannot prove the merits of their sets and speakers.

At the moment of writing it is, of course, too early to make more than a guess at the business value of the show. Naturally, every exhibitor claims bumper business. Most of them have already sold their complete factory output for two years ahead—unless one admits the bare possibility of slight exaggeration. But a little eavesdropping among the crowd does seem encouraging. Quite a large proportion seem to be seriously investigating with a view to purchase. Also, it is interesting to overhear the discussion between visitors and stand attendants. In past years there has been an awful tendency for the "expert" visitor to spend long half-hours telling the long-suffering exhibitor how he ought to design his sets. This year it is not so noticeable (except on Saturday evening). One hears much more of detailed inquiry as to what the sets can do. And I hope that if some of the salesmen I heard die soon, they will find mercy and not justice.

The question of dubious "attractions" by exhibitors has already been raised: it remains to consider attractions of a more reasonable nature. The B.B.C. theatre show seems to me a waste of time and money; but this is a difficult question, and I will bow to the verdict of the box-office. Other attractions comprised mainly the Post Office and Radio Research Board exhibits—both splendid. Suggestions for next year (additions, not substitutes) are: (1) acoustic and audio-frequency research, by the N.P.L.; (2) receiver measurement, by the same institution; and (3) the development of receiver design, a series of receivers from 1922 onwards, by the Science Museum and various manufacturers.

A Remarkable Centrepiece

One other attraction is the admirable general "get-up": stand decoration, illumination, &c. The outstanding feature is an electric clock in the centre of the building with a dial about 17 ft. high, the hands outlined in red neon. Above it the kneeling figure of a girl, illuminated in blue. On each side of the clock are four huge gongs, in descending scale, the largest being nearly 60 ft. high. Reclining against the side of these gongs are four female figures carried out in blue neon light and holding a mallet in green neon. As the clock reaches the hour, the mallets are raised and lowered to strike the chimes; the kneeling figure at the top beats the count of the hour. The clock is synchronised with Big Ben.

At each side of the main feature is a 40-ft. radio mast in red neon sending out blue flashes towards the centre. At each end of the Hall is a neon fountain with ripple and "Cleora" tubes giving a perfect sensation of falling water, while 50 ft. below the roof in the centre hangs a great 40-ft. horizontal decorative fitting illuminated in red and green neon and gold. The whole of this work is carried out in "Claudegen" neon and "Cleora" tubes.

Tin Research

THE first general report of the International Tin Research and Development Council, 378, Strand, W.C.2, describes the organisation and progress made by this body, which was established by the governments and tin producers of the principal countries exporting the metal. Centralisation has been avoided and researches are being conducted in England, France, Germany, Holland, and the United States.

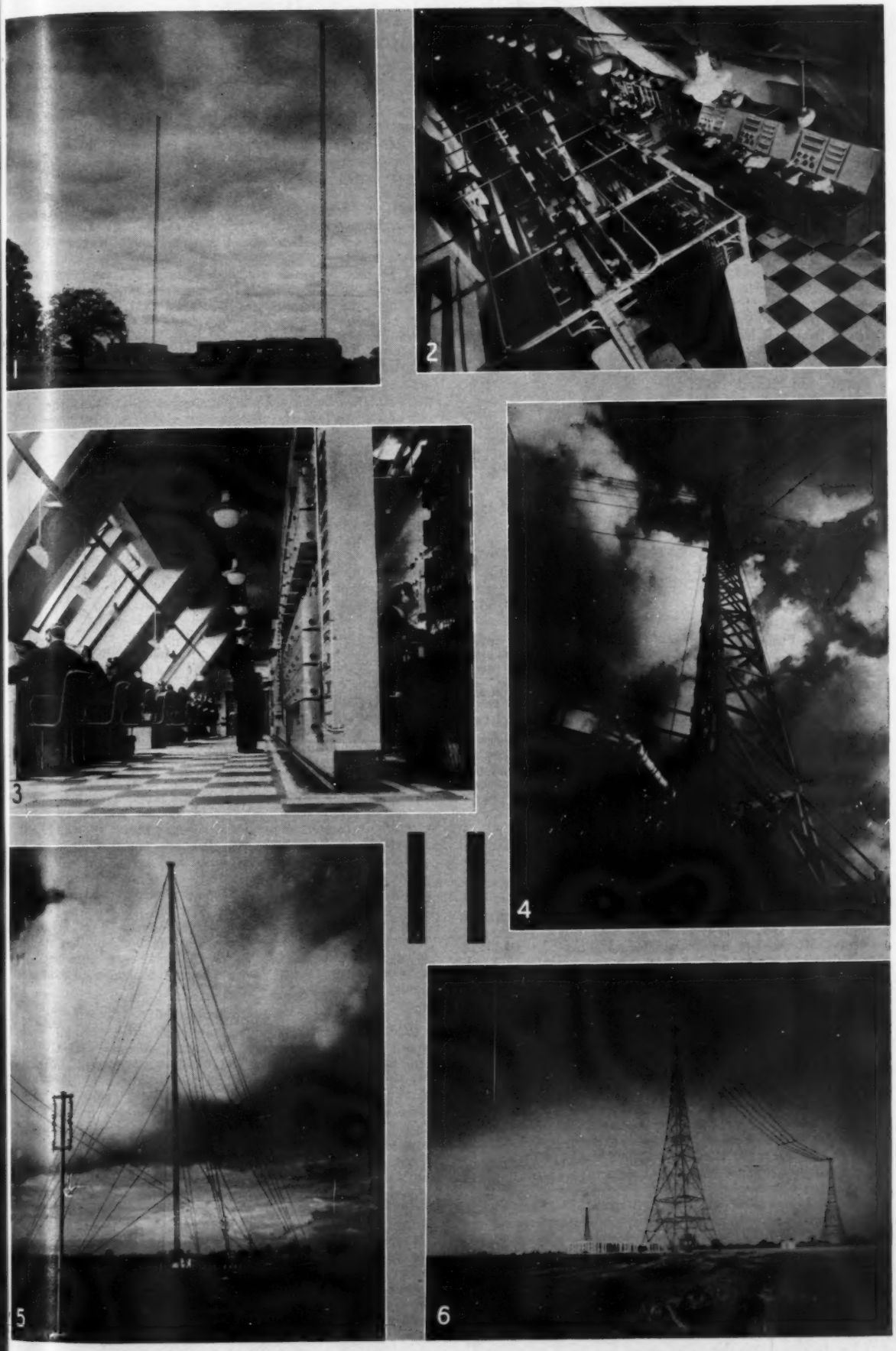
Assistance is being given in extending the applications of tinplate for decorative and other purposes by applying an electro-deposit of nickel or of nickel and chromium. A method of producing non-porous tin coatings by a combination of hot-tinning and electro-tinning has been developed and its economic possibilities are being investigated. Substantial advances have been made in acquiring knowledge of the factors influencing the continuity and evenness of tin coatings produced by hot-tinning. This has involved developments in testing procedure for evaluating the quality of the coatings, the influence of fluxes, &c. In the light of this knowledge the possibility of securing improvements in tinning technique is being actively followed, *e.g.*, an experimental machine for tinning wire has been evolved.

In Great Britain there has been a definite development of the use of ternary lead alloys for cable sheathing in conditions involving vibration. The lead-tin-cadmium alloy has a somewhat lower resistance to fatigue than the lead-antimony-cadmium alloy, but evidence has been obtained that it has a higher resistance to soil corrosion. The tin content is the important factor in this respect and alloys containing 2 and 3 per cent. of tin are used in the appropriate conditions.

An improved method of electro-deposition of tin to give coatings of any reasonable thickness, which is likely to lead to an expansion of this application of tin, has been published. Advances have been made in the extension of this line of work to the development of the electro-deposition of (*a*) bright coatings of tin for decorative purposes, and (*b*) harder coatings by co-deposition with tin of other metals, for applications where resistance to wear is important. A method of producing an oxide film on tin which is capable of being coloured by a dye has been developed. This promises to lead to improved corrosion resistance. The oxide is formed by anodic attack in suitable electrolytes, whereby a transparent or translucent film forms over the surface.

A promising new use for tin seems likely to have been established as a result of investigations carried out to produce a satisfactory tin accumulator. Methods of collaboration were discussed with the inventor and with an important technical group which has already acquired an interest in it. As a result a number of accumulators have been sent to the Council and are being subjected to a wide range of tests. Meanwhile a brochure describing the accumulator and its possible advantages has been prepared and distributed as one of the Council's technical publications. The results of the various tests will be included in a second publication.

The essential features of the cell are electrodes of tin and lead peroxide respectively, in an electrolyte consisting of dilute sulphuric acid. The whole of the cell is filled with porous acid-resisting ceramic material in which the acid is absorbed, so that it is in effect a dry cell. Since no gas is evolved during use, it may be sealed after charging, thus obviating leakage of acid, and may be used even in a horizontal or other position. A special feature is that the tin accumulator is lighter than a lead accumulator of similar capacity. Many possible applications of such a cell are already evident, and may be considerably extended as a result of further research.



The B.B.C. system with which the Radio Exhibition is closely linked

1. The new Droitwich station (to be opened in September). 2. The control room at Broadcasting House. 3. Another view showing amplifier racks and transmission positions. 4. A 500-ft. mast at the West Regional station. 5. The umbrella type aerial and feeder line at the West Regional station. 6. A general view of the Brookmans Park station

Plumbed Joints. By Wm. Maskery

Points to be observed for best results

THERE are three varieties of soft solder; namely, plumbers' wiping solder (two parts of lead and one of tin) which melts at 440 deg. F.; tinmen's solder (one part each of tin and lead), melting at 370 deg. F.; and fine solder (eight parts of lead, four of tin and fifteen of bismuth) which melts at 150 deg. F. The lower and more uniform the heat and the quicker it is applied the better will be the result. The point of fusion of a wiped joint should be heated as little as possible to avoid the formation of oxide which results in a porous mass instead of the homogeneous waterproof shield which is required.

Care must be taken when beating down the ends of hard cast-lead sleeves (split longitudinally) on to soft-lead sheathing; the repeated tappings of the lead dresser may thin the sheathing causing it to be easily burned when the solder is applied by ladle. It is not good practice to beat down split sleeves because a uniform taper cannot be obtained.

When the length of lead necessary to expose the insulation has been removed the two ends of the sheathing should be belled out. This prevents the lead strip laid round the sheath from moving inwards when the sheath is being dressed, and so protects the sheath from dressing bruises and from the entry of solder globules. The lead strip should be well cleaned so that, on the application of the solder, there is absolute cohesion between the sheath, strip and sleeve, for the whole strength of this type of joint lies in the solder.

Mr. Maskery has had many years' experience of the subject on which he writes

Scraped lead should be immediately covered with tallow, otherwise the solder cannot penetrate the oxide film. When solder is applied at the proper temperature its tin component fuses the surface of the lead, producing cohesion between the solder and the lead, provided the sleeve and cable are kept from relative movement.

Removing Unwanted Zinc

A minute proportion of zinc spoils a pot of solder, and it is bad practice to tin brass work by plunging it in molten plumbers' solder. Solder so poisoned may be purified by heating it to 620 deg. F., sulphur being added and the mixture stirred continually. The dross formed by the sulphur and zinc is skimmed from the surface; tin removed by the sulphur must be replaced to restore the original composition of the solder. Solder that has become devoid of tin through over-heating can be rectified by the addition of phosphor tin in a proportion slightly less than pure tin.

Moleskin is the best material for a wiping cloth, preferably part of an old pair of trousers as the nap is worn and it need not be singed to prevent its picking up solder; a convenient size is 4½in. by 4in. The cloth should be about seven layers thick and folded so that the sides are open and the cord in the cloth is parallel to the sides. It should be well hammered, rubbed on a smooth board and singed and soaked in tallow to avoid the adherence of solder. The insertion of a thin sheet of tin or other light metal to form a rigid hollow shape is bad practice; the jointer should always be able to feel and shape his joints with his fingers.

Correct Temperatures

The importance of correct solder temperature cannot be stressed too much; the solder must never be allowed to become red-hot, as some of the tin will have been burnt away. An experienced jointer can test the temperature by holding the back of his hand over a ladleful of solder, but failing a thermometer reading to 600 deg. or more the safest way is to dip a piece of dry white paper into the solder. If the paper turns dark brown at once the solder is ready for use; if it bursts into flame the solder is too hot, or if pale brown, too cool. The temperature of the two-part lead, one-part tin conglomerate mentioned above must be raised from 440 to 600 deg. F.

Solder should be ladled from the bottom of the pot to keep it stirred; that from the surface contains too much tin, since the specific gravity of the latter is 7.29 against 11.36 for lead. The fusing temperatures of the two metals are 440 and 612 deg. respectively.

In wiping a joint with metal pot and ladle the cloth should be held in the left hand with the fingers slightly bent and the thumb holding the top edge of the cloth, which should cover the whole hand. As solder is splashed on with a circular motion, the cloth catches it and presses it to the underside of the joint. The solder must be poured over a good length of sleeve and sheath otherwise it will burn holes through the sheathing which is thinner than the sleeve; the cloth should follow up and down on each side, bringing the solder to the top.

When the solder is in a thoroughly plastic state the jointer can begin to shape the joint, keeping the edges clean and wiping from the back and the top, underneath and up to the top again, bending the cloth to the curve of the joint with the fingers and palm of the hand; this should be done round the joint about three times, after which the superfluous solder can be flicked off with the cloth or drawn off with a piece of silk to make a smooth finish.

If small blobs form on the underside of the joint they can be drawn up into the mass by placing a cold hammer head or chisel on top of the joint. These blobs indicate overheating or too liberal a proportion of tin.

Advantages of the Blow Lamp

From many years of experience I prefer a blow-lamp to the pot-and-ladle method. While it is true that the flame of a paraffin lamp may reach 1,000 deg. F., a skilled man can control its heat immediately, and less practice is required to wipe joints quickly. The cleaned parts are warmed just enough for tinning and the bar of solder is rubbed on their surface; by holding the solder over the joint sufficient is melted off and piled on it. The warmed cloth is taken in the left hand and the lamp applied to the underside of the joint and to the solder. When the latter is quite plastic it is allowed to fall into the cloth, the lump is laid down and the joint formed into shape and wiped smooth with clean edges in one operation.

The joint and its surrounds are never heated beyond 580 deg. F. By this method a joint on a cable with a diameter of 3in. can be wiped with three pounds of solder in as many minutes. As soon as the wiping is finished the joint should be cooled in tallow. Quickness is the great essential, and in the hands of a skilled man a blow-lamp is far more speedy than a pot and ladle. The solder is not over-heated or repeatedly re-heated as with the latter, the use of which calls for too much reliance on the jointer's mate.

When the joint has been wiped and before the solder has quite solidified it can be "washed" by quickly pouring over it a ladleful of cooler solder. This is wiped round two or three times without disturbing the joint and smartly wiped off. Part of the tin in the washing solder is absorbed and brightens what may otherwise be a dull chalky-looking joint. If a joint has been over-wiped the particles of solder are disturbed and it becomes porous, but a bright joint can always be depended upon.

Vertical Joints

The methods described already apply to horizontal work, and vertical joints present no more difficulty. If the pot and ladle method is used the splash stick is made of sheet iron with edges well rounded to prevent the stick scratching the surface, and its handle is bound with thick tape to prevent the fingers from being burnt. Slightly hotter solder than that used for underhand joints should be evenly and copiously splashed on the shaved surface and an inch or two above and below the soiled part. This should be continued until proper heat is obtained, particularly on the brass. The top edge is wiped first; when this is clean the joint is shaped roughly, starting from the back and then coming to the front, surplus solder being pushed to the back. The cloth is curved to the requisite shape and the joint is moulded and wiped smooth with a downward stroke, bringing off the surplus solder.

When the blow-lamp is used for vertical joints the parts are heated and tinned by rubbing with bar solder. This is then melted off and piled evenly round the joint, keeping the heat evenly distributed; the joint is subsequently shaped and wiped clean.

A good recipe for plumbers' black to prevent the adherence of solder beyond the joint line is one ounce of glue melted in a pint of water with enough vegetable black to give a good body. It will be found that this is better than size and lamp black.

Capacitor Motors. By G. Windred

A survey of the various types

VARIOUS methods of obtaining an appreciable starting torque from induction motors operating on a single-phase supply were discussed in an article which I contributed to the ELECTRICAL REVIEW of October 12th, 1923. At that time there was a fairly large number of single-phase systems, so the starting problem was of considerable practical importance. The increasing use of polyphase distribution systems and the application of the commutator motor have done much to simplify this problem, with the consequence that the single-phase induction motor has been receiving less attention.

With the present tendency towards a greater utilisation of single-phase distribution interest in the single-phase motor has been revived, but under conditions which demand a cheaper form of motor than the commutator type, and superior starting characteristics to those obtainable with the customary split-phase machines. These requirements can be fully met by the capacitor motor.

The use of condensers for improving the starting torque and power factor of single-phase motors was introduced by the late Dr. C. P. Steinmetz in the course of his researches into the starting of single-phase induction motors. The principle has been known in this country for more than thirty years, having been discussed in an I.E.E. paper (Journal I.E.E., 29, 1900, p. 849), which referred to the use of a three-phase machine with two of its terminals connected to the single-phase supply and the third terminal connected through a condenser to either of the supply lines.

With this arrangement, originally covered by a Steinmetz patent, full load starting torque can be obtained with a 5-h.p. motor at about 140 per cent. of full load current, and at a power factor and efficiency of approximately 90 per cent. and 80 per cent. respectively—a great improvement on the performance of a split-phase or a commutator motor.

The single-phase split-phase machine costs about 58 per cent. more and the repulsion-induction type about 72 per cent. more than a three-phase motor, excluding starting gear.

One of the reasons why capacitor motors did not find a more extensive use at their inception was that the condensers were bulky and comparatively unreliable. With modern manufacturing technique, based largely upon experience with the construction of condensers for power factor correction and for radio, dry or effectively sealed condensers are available to which the old objections do not apply.

Type.	Fig.	Stg. Torque (% f.l.t.)	Stg. Curr. (% f.l.c.)	P.f. and effcy. *	Relative Cost (Motor only).
Standard three-phase	①	100-300	300-600	—	100
Repulsion—induction (single-phase)	②	300-400	200-350	H	172
Split-phase (single-phase)	③	60-80	400-500	L	158
Monocyclic (single phase)	④ †	25-33	150-200	L	100
	⑤	100	140	H	100
Capacitor type (single phase)	⑥	200-250	400	L	165
	⑦	25-50	300	H	160
	⑧	130-150	400	H	170
	⑨	50-80	300	H	170
	⑩	300	400-500	H	175

N.B.—All torque and current figures are for direct-on starting. All the figures are approximate and are for comparison purposes only.
* H indicates high and L indicates low values, relative to polyphase working.
† This arrangement is usually employed with slipring motors.

A comparison of motor characteristics

Many capacitor motors at present in use are virtually split-phase machines, with a condenser connected in series with the auxiliary or starting winding. This method of starting admits of several possible arrangements, as shown in the accompanying schedule, which begins with particulars of a standard three-phase machine for purposes of comparison.

The repulsion-induction motor (fig. 2) still supplies a wide sphere of requirements where high starting torque and reasonable starting current are required. Its commutator calls for rather more attention and maintenance than are required by a squirrel-cage machine. The power factor and efficiency are relatively high, but the good features are to a large extent offset by a relatively high price, which is nevertheless competitive with other comparable single-phase machines.

The ordinary split-phase motor, concerning which probably more has been written than any other type of motor, is shown in fig. 3. The best starting characteristics are largely dependent upon proper proportioning and arrangement of the windings,[1] but the performance is very poor in comparison with the previous two types, and it is more expensive.

One of the numerous monocyclic starting devices[2] is shown in fig. 4. Although the relatively cheap three-phase motor of standard design is employed the performance is not exceptionally good, and the need for a special starter, with choke coil X and resistance R makes the overall cost high. The monocyclic device employing a condenser as shown in fig. 5 has already been mentioned.

The underlying principle of all the capacitor motors which have been developed recently is the connection of a suitable condenser in series with the auxiliary winding, which is normally set at 90 deg. space phase to the main winding. This arrangement of connections has the effect of shifting the phase of the total motor current nearly into phase with the applied e.m.f., resulting in a high power-factor and starting torque.

The auxiliary winding of the machine shown in fig. 6 is disconnected by the switch s at a suitable moment during the starting operation. In small machines this switch can be of the centrifugal type, but in larger sizes an external switching device is usually employed which may be operated either manually, or automatically by a timing device. Owing to the disconnection of the auxiliary winding, the motor runs exactly as a normal split-phase machine with low power-factor and efficiency.

In order to preserve a good operating power-factor and efficiency the condenser must be retained in circuit; the simplest manner of doing this is shown in fig. 7, in which the only starting device necessary is a switch for connecting the motor to the supply. Owing to the fact that the condenser capacity is fixed by the requirements of operating power-factor and efficiency, the starting characteristics are not so good as those corresponding to fig. 6, where the condenser is in circuit during starting only and can be chosen to give the best starting conditions.

A Combined Arrangement

A combination of the desirable features of arrangements 6 and 7, namely, high starting torque and high operating power-factor and efficiency, can be obtained only by retaining the auxiliary winding in circuit during running and using a different value of capacity of starting and running. A means of doing this is shown in fig. 8, in which the switch s is opened at a suitable point in the starting operation.

This arrangement of connections gives a high capacity at starting due to the parallel connection of condensers C_1 and C_2, and a suitably lower value, corresponding to condenser C_2 only, during the running period. Under these conditions the motor develops a powerful build-up torque, ensuring that any load which can be started from rest will be accelerated to full speed. Similar conditions can be obtained by series-parallel switching of a two-section condenser unit.

The bulk of the condensers for capacitor motors of more than about 5 h.p. become troublesome, especially on low-voltage circuits. The size of the condenser can be reduced by increasing the impressed voltage at its terminals by means of a step-up auto-transformer T.

In fig. 9 the auxiliary winding is connected to a definite point of the auto-transformer, whereas in fig. 10 a starting

[1] Among recent publications in this connection are "The Starting of Split Phase Motors" by N. F. T. Saunders, G. E. C. Journal, 5, No. 2, May, 1934, p. 101; and "Uber die Anlaufverhältnisse von Einphasen-Induktionsmotoren mit Käfiganker unter besondere Berücksichtigung der räumlichen Lage von Haupt-und Hilfswicklung" (Doctor's Dissertation, Techn. Hochschule, Danzig), 1933.

[2] For a theoretical analysis of this type of starting arrangement see the author's small work, "The Operation of Single-Phase Induction Motors," A.E.S.D. Pubg. Co., 1929.

switch is moved from position S to position R at a suitable point of acceleration, thus varying the potential applied to the condenser, and producing conditions similar to those obtained with two condensers as in fig. 8.

In comparison with ordinary single-phase working, the advantages of the capacitor motor may be summarised as follows: (1) high starting torque due to phase relations introduced by condenser which also results in high power-factor; (2) high efficiency, when auxiliary winding remains in circuit during running, due to more efficient utilisation of total stator copper; (3) high overload capacity, when auxiliary winding remains in circuit, due to torque component of auxiliary winding; (4) quiet running due to approximately symmetrical stator flux instead of elliptical field giving unbalanced pull; (5) absence of commutator, resulting in lower maintenance costs and elimination of radio disturbance—an important feature with domestic motors; (6) closer compliance with supply regulations—the most exacting requirements for high starting torque with limited starting current can be met by slip-ring capacitor motors; (7) simple control gear, in no case necessitating more than a two-position switching arrangement.

These features, coupled with a relatively low capital cost enable the capacitor motor to be successfully applied to all normal power requirements.

In the preparation of this article, I have had the advantage of the co-operation of the Allgemeine Elektrizitäts Gesellschaft, Messrs. Brook Motors, and the British Thomson-Houston Company, to whom I desire to tender my thanks.

A short list of outstanding items of literature which may be of assistance to designers is given below. A more complete bibliography is contained in my book.

"The Single-Phase Induction Motor," by C. P. Steinmetz, Trans.A.I.E.E., 15, 1898, p. 25.

"Notes on Single-Phase Induction Motors," by C. P. Steinmetz, Trans.A.I.E.E., 1900, p. 25.

"Interpretation of Test Data, Single-phase Squirrel-cage Induction Motor," by C. A. M. Weber, Electric Journal, 13, 1916, p. 381; gives procedure for calculation of single-phase induction motor characteristics from locked and running data.

"Unity Power-Factor Motor with Squirrel-Cage Rotor," by Millard C. Spencer, *Electrical Review* (Chicago), 74, 1919, p. 331; describes action of two-phase motor with one phase in series with capacity; tests results on a machine of this type are compared with a split-phase machine of same output.

"On the Design of Split-Phase Motors," by E. A. Binney, *Electrician*, March 18, 1921; numerical example of calculation of starting torque for various ratios of starting to running turns; effect of frequency upon starting characteristics is considered.

"Current Locus of Single-Phase Induction Motors," by J. K. Kostko, Trans.A.I.E.E., 41, 1922, p. 215 (Journ. A.I.E.E., 41, 1922, p. 30). Gives circle diagram based on analogy of two polyphase motors with primaries in series.

"The Single-Phase Induction Motor," by L. M. Perkins (Journ. A.I.E.E., 44, 1925, p. 499); circle diagram evolved from cross-field theory.

Power Factor Correction.

By G. W. Stubbings, B.Sc., A.M.I.E.E.

A new method of calculating the economical limits

CORRECTION of power factor beyond 0.9 to 0.95 is rarely economical, because a small decrement in the reactive component of the load becomes less and less effective in reducing the kVA as the power factor approaches unity. The point at which power factor correction ceases to effect further economies can be calculated by algebra. The graphical construction set out hereunder is in many ways more instructive than the analytical method.

In the elementary diagram, fig. 1, OI is the vector of the load current, lagging by an angle ϕ on the supply voltage. Completing the triangle in the usual way, OI_0 is the active component of the load current, and II_0 is the reactive component. If OI_0 represents to scale a fixed demand in kW, OI will, to the same scale, represent the demand in kVA at a power factor equal to cos ϕ. If the power factor is reduced from cos ϕ to cos ϕ_1, and the load in kW remains constant the kVA of demand will fall from OI to OI_1. This decrease in kVA has been obtained by a reduction in the reactive component in kVAR from I_0I to I_0I_1.

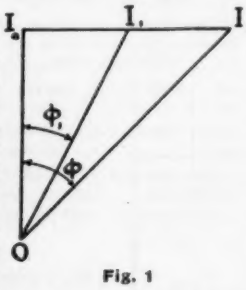


Fig. 1

The diagram is, however, capable of a further interpretation. If OI_0 represents to scale the standing charge per kVA of maximum demand, then the standing charge per kW at a power factor of cos ϕ will evidently be OI, and the charge at a power factor of cos ϕ_1 will be OI_1. The reduction in the standing charge per kW has been obtained at the expense of the reduction in the kVAR per kW. Since the capital and maintenance cost per kVAR of correcting apparatus will not be equal to the standing charge per kVA the length II_1 will not be representative of the monetary set-off per kW against the reduction in the standing charge from OI to OI_1 and further geometrical construction is necessary, as shown in fig. 2.

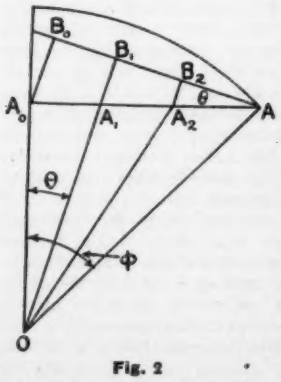


Fig. 2

Here, OA_0 represents to scale the standing charge per kVA of maximum demand. OA is the standing charge per kW at a power factor of cos A_0OA. Let a line AB_0 be drawn from A, making with AA_0 an angle whose sine is equal to the ratio n of capital and maintenance charges per kVAR of power factor correcting apparatus to the standing charge per kVA of demand. Let us now consider that the power factor has been improved by the installation of correcting apparatus which reduces the kVA charge from OA to OA_2. The capital and maintenance costs incidental to the installation of this apparatus will be represented to scale by a line equal in length to n times AA_2, or to A_2B_2 drawn perpendicular to AB_0, since, by construction, the ratio of A_2B_2 to AA_2 has been made equal to n. The total charges per kW, being the standing charge, and the cost of the power factor correction are now represented to scale by OA_2 and A_2B_2.

It is almost self-evident that the sum of these two lines has its minimum value when OA_1 is perpendicular to AB_0, the two components becoming co-linear. It is not difficult to prove that the total cost per kW is not changed by small departures from the angle A_0OA, which makes the OA_1 perpendicular to AB_0, and this is the geometrical condition for a minimum value. We conclude, therefore, that when the power of the supply is such that the vector of the kVA of demand becomes perpendicular to the line AB_0, the total costs, made up of the capital and maintenance costs of the correcting apparatus and the standing charge, is a minimum. This condition applies when the corrected power factor is such that sin ϕ is equal to n, the ratio of the charges per kVAR of correcting apparatus to that per kVA of maximum demand.

We can deduce from the above reasoning a simple graphical construction which gives the most economical power factor to which to correct when the cost per kVA of maximum demand and the charges per kVAR of correcting apparatus are known. In fig. 3, OA_0 is set off, as before, to represent to scale the annual cost per kVA of maximum demand, and the angle A_0OA is equal to ϕ where cos ϕ is the uncorrected power factor. The arc AD is drawn with O as centre, and semi-circles are drawn on OA_0 and OA as diameters in the manner shown. A_0X is set off to represent to scale the annual charges per kVAR of correcting apparatus, cutting the semi-circle A_0XO in X. The line OC through X then gives the angle A_0OA_1, from which is obtained the ratio OA_0 to OA_1, the most economical power factor to which to correct.

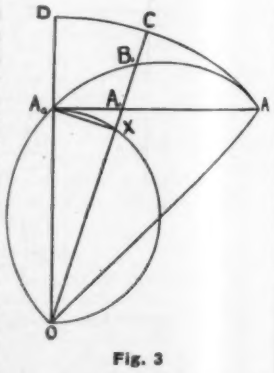


Fig. 3

OB_1 is the total annual charge per kW of maximum demand, compounded of OA_1, the standing charge, and A_1B_1, the capital and maintenance charge of the correcting apparatus. The net saving per kW is represented to scale by the distance B_1C_1.

It is a fundamental mathematical principle that maximum and minimum values of variables are also stationary values, in that the actual magnitude of the variable is nearly constant in the neighbourhood of a maximum and/or a minimum. It therefore follows that the total charges, compounded of the standing charge per kW and the charges in respect of the correcting apparatus, will be little affected if the final power factor varies appreciably from the theoretical value corresponding to the relation sin $\phi = n$. This point is clearly apparent from the diagram fig. 2, and should be borne in mind when fixing the rating of power factor correcting apparatus.

Modern Meter Testing. By S. Hunt, A.M.I.E.E.

THE Meter Testing Department of the Westminster Electric Supply Corporation, Ltd., has to deal with the maintenance and systematic checking of about 45,000 meters at present on the network. In addition, some 16,000 d.c. meters have been replaced during the last five years by a.c. meters, and the present output is about 10,000 a.c. and 1,000 d.c. meters per annum.

Considerable time and thought have been given to various methods of testing with a view to reducing to the minimum the time and labour involved. It has been necessary to adopt a system of mass testing, and it was found that, with large batches of meters, dial testing is the most accurate and convenient. The equipment for a.c. testing comprises four Ferranti sets, three handling 20 meters each and one which deals with 40 meters. These sets are connected to a 3-phase, 4-wire distribution board, which is so arranged that testing can be carried out conveniently and quickly.

A Ferranti 40-meter test set

The repair shop of the Westminster Electric Supply Corporation

Single-phase Testing

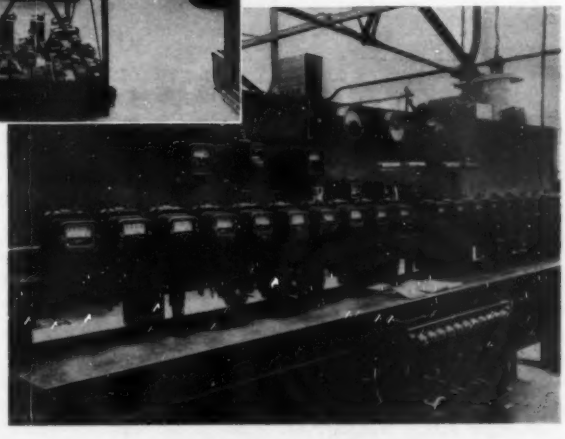
Single-phase testing is carried out as follows: Two standard meters of 50 A capacity and two of 10 A capacity have been specially prepared and calibrated with large testing dials of 2½ in. diameter and 1¼ in. pointers which, of course, give very close readings. These meters cover every range of current from 100 to 0.5 A and they are checked periodically with the standard instruments. The reason for having two rotating standard meters always in use is that, as two meters very seldom develop the same fault at one time, one acts as a check on the other, and the testers can at once detect any variation on these meters between standard check periods.

Fuse carriers are used instead of switches so that two circuits cannot be closed at one time. Two ammeters, one for large and one for small currents, are put into circuit in a similar manner to the rotating standard meters. The 40-meter test bench deals with 200 meters a week. All the test sets have a time-switch connected, which is put into circuit during light load runs; these runs are naturally of long duration, but they are arranged for night periods and end some time after the test assistants have arrived in the morning.

The advantage of dial tests, apart from the accuracy obtained, is that the testers can so arrange their work that more than one batch of meters can be attended to at one time, and various other duties carried out between the loads run on the meters. Another useful piece of apparatus incorporated in every test set is a meter so arranged that the disc does not move when 0.5 power factor is imposed on the circuit, which again is a great saver of time, as no instruments have to be watched while running a p.f. test.

The loadings on meters under test are as follows: for 10-A meters, 0.5 kWh; for 25-, 50- and 100-A meters, 5.0 kWh; and for larger meters 50 kWh, so that an accuracy of 1 in 500 is obtained for all dial readings. These readings allow the testers to note at sight whether the meters are within their limits of accuracy without the tedious method of working out percentage errors for the various loads on the meters. The standard instruments used for correcting the rotating standard meters are all of the Elliott dynamometer type, with large open subdivided scales. These instruments are periodically checked for accuracy on the d.c. potentiometer.

The supply for d.c. testing is obtained from a bank of 48 cells which, when suitably connected, deal with all currents up to 1,000 A, another bank of four cells giving 500 A; each is used for currents up to 2,000 A at 2 V. These are mostly used for checking the voltage drop on large d.c. shunts, &c. Dial testing is again the method used. Meters are connected in batches of 50, and the current kept constant throughout the time necessary to give the desired advances on the meters which are under test.



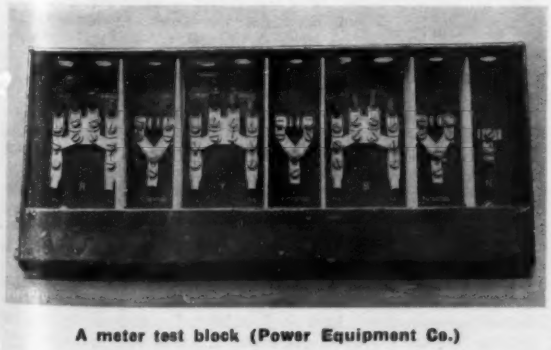
A set for testing 20 meters

The ammeter used is an Elliott moving-coil instrument which can very quickly be connected to a series of shunts arranged to give large-scale readings for every load down to starting current. This standard ammeter is checked periodically on the potentiometer. In addition, all meters have a preliminary test with a meter in circuit that has been tested and sealed by the local authority.

Checking Prepayment Meters

The prepayment meter adopted by the Westminster concern is one that lends itself to a price change per kWh very simply and quickly. No change is allowed to be made on circuit, and all this work is done in the Meter Testing Department, where the checking of wheels, &c., can be done with the utmost care by responsible assistants. There are 7,500 prepayment meters on circuit, and the demand for them is about 1,500 per annum. The area covered is so varied that many different rates have to be given to suit consumers. The Meter Testing Department is called upon to supply the correct meter for any tariff that may be required for rental and kWh charge.

The Meter Department has a well-lighted repair shop in which eight men, wholly engaged on meter repair work, deal with all the d.c. and a.c. meters brought in from circuit for overhaul. The charge hand and men engaged on slot-meters, time-switches and special work are skilled clock-makers. Clean mercury is obtained from four mercury stills. As the cleaning is done under vacuum, there is no danger to the staff from fumes. When the d.c. meters have been re-



A meter test block (Power Equipment Co.)

paired they are put through a preliminary test on a special rotating test set, enabling a check to be made in a few minutes at full and 1/10th load before they are passed out to the test room for final testing.

Every meter has the company's number stamped on the property label, and a record card, used in actual testing for recording the advances of meters under test, is made out and numbered with the maker's serial and company's number. These cards are filed after checking has been strictly carried out, it being most important to note the date of any change of design of manufacture or of a new type of meter being used in order that the behaviour of the meters due to these changes may be noted. In addition, a complete life history of every meter is kept in book form. This enables a new card to be used every time the meter is returned to the test room for routine testing, and the previous card is destroyed.

All the various operations of the department are standardised so far as is consistent with economy and accuracy.

Peak and Reserve Plant

German methods of meeting the problem of occasional high demands

THE reduced consumption of electricity in Germany during the crisis of 1930-32, writes H. Schulze in *Elektrotechnische Zeitschrift*, resulted in the shutting down of local peak-load power stations and a considerable amount of base-load plant in pithead stations, leaving the diminished peak demands to be served in increasing measure

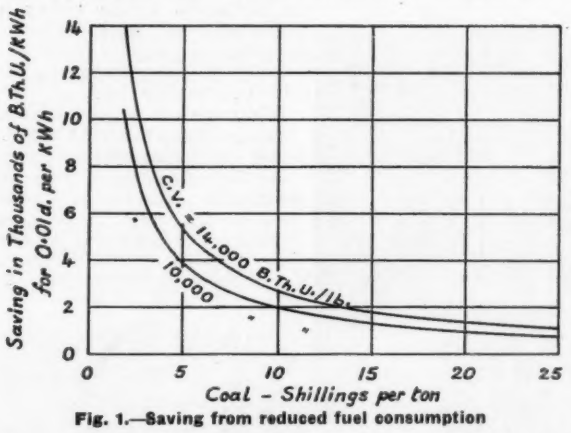


Fig. 1.—Saving from reduced fuel consumption

by transmission networks. Now, with the revival of consumption, the peak-load problem is returning to its former importance, and in order that supplies to small consumers may be cheapened it is necessary to restore idle plant to service as extensively as possible.

The cost of private generation places an upper limit on the price per kWh which can be charged to large consumers; hence, for commercial as well as technical reasons, the cost of idle plant and peak supply provisions falls largely upon domestic and other small consumers.

A Running Reserve

The so-called "Stettin economy system" consists in operating the base-load boilers and turbines at full load and maximum efficiency with a running reserve, as distinct from a stationary reserve, ready for immediate peak or emergency service. The boilers in the running reserve are kept charged with water at the temperature of the saturated steam, and the stand-by turbines are kept running in vacuum at from one-tenth to one-fifth of normal speed.

The peak or reserve plant can be put into service within 1-1½ min. by means of auxiliary oil-firing, and requires practically no additional investment as long as existing old boilers and turbines are available. At present, and for some time to come, the guiding principle may be to build all new units for the highest attainable efficiency, and to use old base-load units thus liberated for peak and reserve service on the Stettin system.

There is, however, a definite limit to the thermal economy of condensing turbines and, as this is approached, there is less incentive to install new sets for reduced fuel consumption, and the lower capital cost of plant built specially for peak service becomes a more important consideration.

A saving of 0.01d. per kWh may be effected by a reduction of $1.87\ C/P$ B.Th.U. per kWh in the heat consumption (C=calorific value of coal in B.Th.U. per lb.; P=cost of coal in shillings per ton) or by a reduction of $7.3\ f/r$ shillings per kW in the capital cost of the plant (f=load factor, per cent., and r=capital charges, per cent. per annum). Figs. 1 and 2 show respectively the reduction in heat rate and the capital cost per kW corresponding to 0.01d. per kWh under stated conditions.

If 20,000 kW extra generating capacity is required in a certain supply area and new base-load plant would consume 13,000 B.Th.U. per kWh at 68.5 per cent. annual load factor (6,000 hr. use per annum), compared with 15,000 B.Tb.U. per kWh in the existing base-load plant, with coal of 10,800 B.Th.U. per lb. at 12s. per ton the saving would be $0.01\times(15{,}000\text{-}13{,}000)\times12/(1.87\times10{,}800)=0.012$d. per kWh.

For the same saving from fixed charges at 12 per cent. per annum the difference in capital costs would be $(0.012/0.01)\times(7.3\times68.5)/12=50$s. or £2 10s. per kW. Actually, the difference between the capital costs of base-load and peak-load plant would be about £(10−4)=£6 per kW, so that, in the case considered, a peak-load plant would be the more economical arrangement, apart from the further savings on transmission costs.

Lower Capital Costs and Smaller Space

The trend of technical development in special peak-load plant is towards lower capital costs and smaller space occupied, the former consideration being important where the load factor is low and the latter where installation in built-up areas is concerned. The operation of the Benson boiler at a pressure varying with the turbine load is analogous to the Thury series system of constant-current transmission. The steam flow and temperature in the turbine, and the heat consumption per

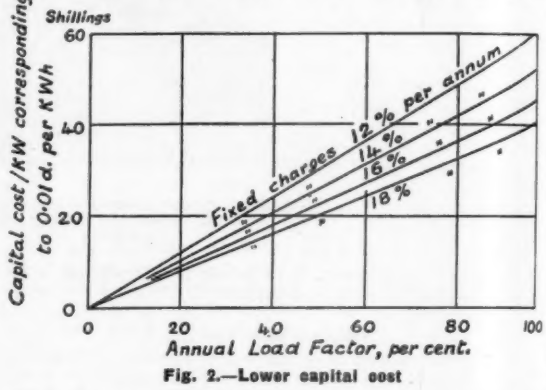


Fig. 2.—Lower capital cost

kWh remain nearly constant at all loads, and the boiler feed pump works against only that pressure which is actually utilised by the turbine.

Another method of meeting peak-load requirements, specially attractive where extra-high pressure steam is used, is the combination of pumped-water and steam storage. The high-pressure stage continues to operate at full load during periods of low demand, surplus power being applied to pumped hydro-electric storage by back-pressure working in conjunction with a variable-pressure steam storage.

Aerodrome and Airway Lighting

THE British Standards Institution has issued a Standard Specification for land aerodrome and airway lighting. This Specification is supplementary to the "Guide to Aerodrome Lighting" which was issued in 1932, and is based on the decisions of the International Commission on Illumination, the committee concerned with its preparation acting also as the British National Committee of the International Commission on Illumination. It is the result of four years' work by the committee, which is under the chairmanship of Major R. H. S. Mealing, of the Air Ministry, and on which are represented the following bodies: The Air Ministry, the National Physical Laboratory, Imperial Airways, the British Electrical and Allied Manufacturers' Association, the Electric Lamp Manufacturers' Association, Messrs. Chance Bros., Claude-General Neon Lights, Ltd., the Gas Accumulator Co., and the G.E.C. Research Laboratories.

The Specification deals with the characteristics of aerodrome and airway beacons; boundary lights; aerodrome, airway, landing area, and air navigation obstruction lights; landing area floodlights; illuminated wind indicators and landing direction lights. An appendix includes the specification for the aviation colours, red, orange and green, and outlines a method of finding the distance apart at which airway beacons should be spaced. Copies of the Specification (No. 563-1934) may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

Recent Reyrolle Developments

AMONG a number of new developments by MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, is the "Reyvaux" off-peak load control. The operation of this system of control depends upon the use of a bi-metal relay which can be set to trip at various current values and is automatically load-discriminating.

The apparatus includes a transformer-operated relay mounted with a double-pole, 20-A, 250-V or a triple-pole, 15-A, 440-V contactor on a moulded base and protected by a sheet-metal cover. The transformer primary is in series with one side of the normal load and the secondary is connected to the bi-metal strips. The transformer is of the saturable-core type; its primary can carry up to 25 A, but the secondary current cannot greatly exceed the value required for operating the relay contacts.

Two standard current transformers meet normal requirements; these are designed to give control between 1 and 3 A and between 2 and 6 A. When the normal load falls to 70 or 80 per cent. of the selected setting, the relay closes and, as the contacts are in series with the contactor-operated solenoid, completes the circuit of the auxiliary load.

Crane Control Equipment

The company's switches and plugs for such duties as dock-side crane control have been modified. The unit may be d.p. or t.p. with or without fuses. It consists essentially of a straight-through cable-box with a switch and socket mounted on it; the switch is in a tee from the cable to the socket, from which the supply is given through a protected-type plug mechanically interlocked with the switch handle. The cable-box and socket chamber are compound-filled, and the cable-box and glands are split lengthways so that the switch connections can be teed-off without cutting the supply cable.

The units are supplied for 100 to 250 A (illus.) at 660 V, and can be adapted for special duties such as for horizontal mounting on a shallow pit, vertical mounting with a socket fitted behind the switch to reduce the overall height, and for mounting under a wharf.

The "Reyvaux" off-peak load control

A new design of directional over-current relay (Type T.J.E.) has also been introduced, the principal characteristics of which are: (1) a time range of from 0.2 to 3 sec., adjustable by merely turning a dial; (2) the current transformers are not open-circuited when the setting plug is withdrawn; (3) the current coils take only 4 VA at a current equal to the plug setting and the voltage coils 12 VA at rated voltage; (4) overloads up to 40 times f.l.c. may be carried momentarily; (5) the contacts will control tripping circuits taking up to 600 W d.c.; (6) correct operation down to 1 per cent. of normal voltage and with a current lag of 90 deg.

The relay consists of over-current and directional elements. The over-current element is of the shaded-pole type, the phase-splitting device being a coil in series with a resistance and the directional relay contacts, which complete the series circuit. The directional element operates on the induction-wattmeter principle and consists essentially of an aluminium disc rotating between electromagnets, the upper one energised from the current transformers and the lower from the voltage transformers of the protected circuit. The torque caused by the two fluxes acting on the disc tend to close the relay contacts when current flows into the protected apparatus.

The directional element may be used as a Type E.S. reverse-current relay; it is fitted with tapped coils from which the tappings are brought out to a plug bridge for varying the current setting.

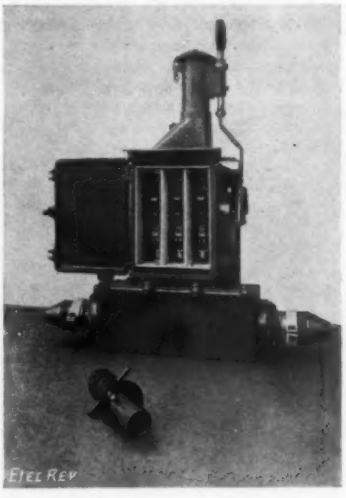
The chief application of the T.J.E. relays is for graded directional over-current protection of ring mains.

The rotary sensitive (Type R.S.) relay introduced by the company is of the electromagnetic type with an armature attracted from a lower to a higher field intensity, but rotating in its own plane.

The upper and lower magnets are in opposition and the flux threads the armature in such a way as to produce a torque that causes it to rotate into the air gaps against the restraint of a control-spring, the tension of which is adjusted by a calibrated torsion head, thus varying the current setting. The ends of the armature are so shaped that the driving torque can increase more quickly than the restraining torque of the control-spring, and this prevents the relay from creeping before the operating current is reached. Two adjustable stops acting on both sides of the armature limit the contact travel, reducing the stress on the pivots during heavy overloads.

The contacts have a wiping action to prevent bouncing on operation and subsequent locking in is prevented by a backing spring behind the resilient fixed contact. A slight inverse time lag is secured by the inertia of discs carried on the pan on which the moving contact is mounted. An auxiliary d.c. contactor prevents the main contacts from carrying the full tripping current. The normal current setting ranges from 35 to 80 mA and the power consumption from about 0.03 to 0.12 VA. These relays are applicable to all protective systems requiring sensitive instantaneous operation.

By adding a compensating electromagnet, which produces a torque tending to hold the relay against the stop, so increasing the operating current, greater stability is obtained with straight through faults. In this modified pattern (RSG) the windings are normally so proportioned that the increase in current is 20 per cent. of the current in the compensating winding; tappings give 10 or 5 per cent. compensation.



250-A triple-pole combination for dockside crane control

A new line of remote position indicators has also been put on the market. The object is to provide a means of obtaining at a distant point, over a minimum number of pilot wires, a continuous indication of the movement of mechanisms of many kinds, such as transformer tap-changing equipment, regulators, water level floats, valves, &c.

The transmitter consists of a simple potentiometer resistance, the moving contact of which is operated by the movement of the mechanism of which it is desired to obtain remote indication. For this purpose a mechanical link must be provided between the moving contact and the mechanism.

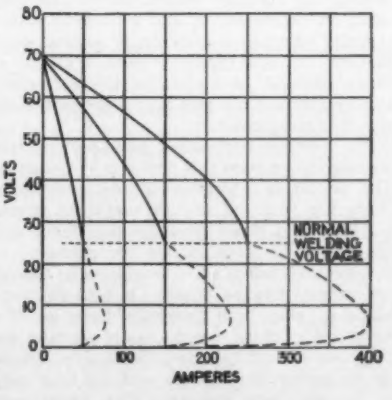
The receiver is a moving iron instrument with the usual control spring replaced by a coil, which gives electrical control. This controlling coil actuates an additional moving iron attached to the same spindle as the main operating iron, and the several parts are so arranged as to compensate for variations of the supply-voltage to such an extent that a change of plus or minus 20 per cent. has no effect on the indication.

Where supply mains are available at the receiving end of the apparatus as well as at the transmitting end, only a single interconnecting pilot wire is needed between the transmitter and the receiver, but otherwise three connecting wires are necessary.

An Improved Welding Set

A modification has been made in the design of the single-operator arc-welding d.c. generator. It is designed for high-speed work with either bare or covered electrodes. The two shunt windings enable a striking voltage of 70 V on open circuit to be obtained and an immediate recovery of voltage after breaking the arc. The stabilisation of the arc due to the inherent characteristics of the generator makes a choking coil unnecessary. On short circuit the current falls to a relatively low value after the initial kick.

The normal output is 250 A, but for heavier currents two generators can be run in parallel without difficulty. By means of a controller mounted on top of the equipment any operating current can be selected between 50 and 250 A. For small electrodes 25 A is obtainable through a resistance embodied in the controller. The set is portable, entirely metal-clad and drip-proof.

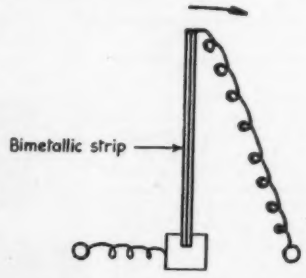


The drooping current-voltage characteristic of a Holmes welding generator

Thermal Maximum Demand Ammeters. By E. H. W. Banner

Uses and characteristics of the three types

IN districts that are rapidly developing it is often required to know the maximum load carried by any particular transformer, distributor, or domestic circuit (the maximum loads of which are usually little known) over a period of hours, days or weeks. This requirement is different from that associated with metering, where the maximum load is used to assess the charge for revenue purposes, and which is dealt with by the addition of auxiliary contacts to the integrating meter installed for kWh readings. Through these contacts the meter supplies impulses to an electromagnetic maximum-demand indicator or recorder, usually resetting the incrementing pointer to zero at half-hourly or other regular intervals.

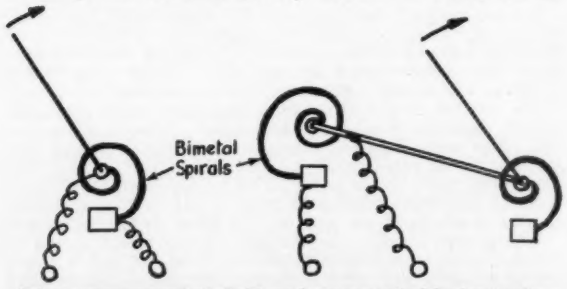


A simple, direct-acting type of ammeter which requires gearing

Such an arrangement is expensive and justifiable only where the meters are already installed for revenue purposes and the amount of money involved is large. For ascertaining load alone a much simpler method suffices, and instead of an integrating kWh meter, an ammeter is used as a basis. The simplest scheme is to use a moving-iron ammeter fitted with an auxiliary pointer which is carried forward by the indicating pointer and remains to show the maximum reading.

There are instruments on the market which are more or less satisfactory initially, but their auxiliary pointer shows a tendency to creep, especially after periods out of use. The general aim is to provide such a high damping that the indicating pointer does not overshoot, and to have an auxiliary pointer with such friction that it will not creep.

Perhaps the most satisfactory manner in which this is attained at present is by the use of a fluid-filled dashpot for the auxiliary pointer, so that a sudden but unsustained impulse from the indicating pointer due to overshoot has no effect, and only sustained pressure due to a steady increase of reading moves the auxiliary pointer forward while such pressure lasts. This state requires considerable care in adjustment, and it remains to be seen if such a device continues effective over a long period.



Spiral uncompensated (left) and compensated instruments

The Thermal Bimetallic Method

The two requirements of high torque to overcome the friction of the auxiliary pointer and low torque to minimise overshoot are incompatible, and a different method altogether—the thermal bimetallic—is generally adopted and found to be satisfactory. In this type overshoot is absent and high torque is easily attained. A bimetallic strip is heated by the current in the circuit, and the resulting deformation of the strip operates the indicating pointer.

For revenue purposes a half-hour period is usual, but for loading information this period is by no means always required. The period of operation of the instrument when full-scale current is switched on may vary from about an hour to a few minutes, and three types provide these different periods. If the bimetallic strip carries the current to be measured, its temperature will reach a maximum in the minimum time, and its section may be chosen so that the period is two to five minutes; very brief overloads have no effect, but the more sustained overload due to motor starting will be shown.

In the second type heat is received by the bimetallic strip by convection through air and the time period is of the order of ten to forty minutes. The remaining type includes a refractory between the heater and the bimetallic strip, and the time period may be an hour to an hour and a half, dependent upon the amount of thermal lagging. Much ingenuity is shown in the means of driving the indicating pointer through gearing.

Of the first, or short-period type, one of the simplest is that in which a bimetallic strip is wound in a spiral, the inner end being connected to the pointer while the outer end is fixed; this is not compensated for ambient temperature. An extension of the method using two similar but opposing spirals is, however, compensated on this account if one of the spirals carries the current to be measured and the other does not. The strip length and section may be chosen so that a torque of the order of 50 to 100 cm. gm. is obtained; this is far higher than that obtainable with any ordinary moving-iron ammeter and is ample to operate the auxiliary pointer with its friction.

On the other hand, as the current has to pass through the strip itself, the possible range of length and section is not very wide for the torque required. As a convenient current in practice is five to six amperes, such an ammeter may be used with a standard current transformer for current ranges between two or fifty amperes. Higher ranges are possible with the direct-conduction type which uses a short and straight strip having limited movement but with a higher gearing permissible on account of the higher torque.

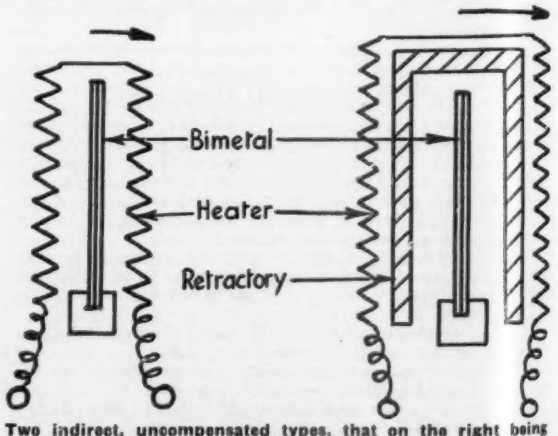
With a given torque and power consumption for the spiral uncompensated type the addition of the compensation reduces the deflection for a given current or conversely increases the power required for full-scale as there is now a double restraining force. An alternative is to connect the two spirals mechanically in series so that no extra restraining force is introduced. This involves either a double spindle, each carrying one element, driven one from the other, or a large diameter spiral with a centre-tap to pass the current through one half only. The first method is better electrically, as the two spirals may be separated and so better insulated thermally, but the mechanical work is more complicated.

Indirectly-heated Instruments

The indirectly heated types only differ between themselves by the thermal lagging, either air or a refractory material. They are similar in that the current circuit is independent of the bimetal which, in practice, is a straight thick strip of a length and section determined by the size of the case and the torque required with a given gearing.

These time-delayed types are not compensated for ambient temperature quite so simply as is the direct-acting type. Sometimes a second bimetallic strip is arranged away from the heater and the differential gearing employed to connect the indicating pointer to the two strips. In other instruments it is absent altogether, and it is argued by some engineers that for a long time-lag such compensation is unnecessary and gives a false indication of the loading conditions existing at that temperature.

The heater, being electrically independent of the bimetal, may be wound for any current from a few milliamperes to a hundred amperes, and as it is separate from the movement it is easier to insulate from the case. The direct-acting type requires insulating from pointer to case unless it is always to be used with a transformer having one secondary terminal earthed.



Two indirect, uncompensated types, that on the right being thermally lagged

With any of the types described the increasing reading with a given current steadily maintained closely follows an exponential law, both for rising and falling on switching off. If

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Electric Baking in a Village

The progress of rural electricity supply was signally exemplified this week when the dough in a village bakery was first mixed by the aid of our useful friend the electric motor.

For many years now, two men sweating profusely and puffing worse than that, have laboriously turned the mixer by hand every night. I found them out, and last night we stood by and watched the work done without one drop of sweat or one gasping puff, and it cost the baker two-thirds of a penny for the electricity used.

The village is Botesdale, Suffolk. The baker is a man who lived during many years of Queen Victoria's reign, and he is still marching on.

LESLIE HOULDNIDGE.

Diss, Norfolk, *August 15th.*

The progress of the Galloway hydro-electric scheme is dealt with on the next page. Our picture shows the Glenlee power station and on the left the outlet of the 3½-mile long tunnel between the station and the Clatteringshaws reservoir

Modern Methods of Wiring Ships

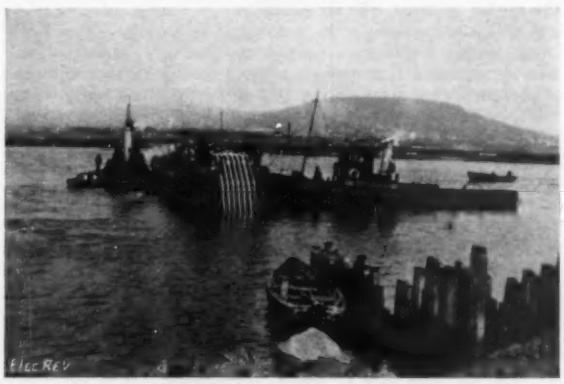
There are two points in Mr. Fowler's interesting article in your issue of August 10th which cannot be left unchallenged. First, his strong advocacy of the use of conduit. Conduit was very largely used on board ship a number of years ago, and machinery spaces were commonly "piped" throughout. It is not too much to say, however, that modern methods of ships' wiring dispense with it as much as possible, and the reason for its unpopularity is not hard to find. Ungalvanised tubing has been commonly used, for the cost of galvanised screwed tubing is almost prohibitive, and the life of ungalvanised conduit, where exposed to weather and similar conditions at sea, is very short, and its renewal an awkward and costly job.

Further, under the conditions of widely, and often rapidly, varying temperature and humidity experienced on board ship considerable condensation takes place inside conduit, bends hold the water, rusting takes place freely (and there is no greater enemy to rubber cables than wet rust) and altogether the conditions under which the cables in such tubing exist are as bad as they could possibly be.

Conduit is, of course, very useful in some places on ships, but the use of it should be limited to lengths open at both ends and with no bends to hold water, and where exposed to weather or conditions giving rise to condensation it should be galvanised. The use of conduit made of insulating material, such as fibre or bakelite, is attractive for some purposes, but up to the present it is not obtainable at reasonable cost or in sufficiently long lengths.

The second point is fire risk, about which Mr. Fowler makes the surprising statement that "Modern designs give more attention to the detection of fire than to its avoidance." In actual fact there is nothing to which British shipbuilders pay more constant and thorough attention than the elimination of fire risk. Modern design has done away with the oil lamps and candles which were commonly fitted, even after the War; it has cut out much of the highly inflammable curtains and "trappings" and so on.

Designers have produced the safe electric heater, have introduced fireproof bulkheads and the use of boards that are harder to set alight than cut wood and so forth. And on the electrical side it has brought in the comprehensive I.E.E. Rules for Ships' Electrical Equipment and the B.S.I. Specifications. The interest in fire alarms and detectors arises not as a result of greater heedlessness to fire risk, but as a result of the Convention Rules and the modern demand for increased safeguards.



Laying cables across the Victoria Channel, Belfast
(See note on page 260)

Thermal Maximum Demand Ammeters (*continued from opposite page*)

the time taken to reach full scale is, say, 3 min., then after 1½ min. the reading will be 0.632 of full scale. The time to return to zero is longer than that to reach full scale with the direct-conduction type, but the law remains the same.

The presence of gearing to obtain the required scale angle is no disadvantage because the torque can be high and a light spring on the pointer pinion overcomes backlash. The scale angle is usually about 90 to 120 deg., but about 300 deg. may be obtained if required. The scale shape is nearly linear with the exception of about the first 10 per cent. The ammeter may also contain a switch to open or close a local circuit on a predetermined reading being attained. The auxiliary pointer has a resetting knob outside the case, and often this is provided with sealing facilities.

Alternatively, fixed contacts may be provided so that the pointer itself closes or opens the local circuit, but this is generally only possible for small-current alarm circuits such as battery operated bells. The usual consumption varies from about 3-6 W at full scale deflection; the higher the torque the higher the consumption.

The principle may be applied to voltage indication, either maximum or minimum or both. Electrically, either a special voltage transformer is required or a high-resistance winding if it is of the indirect type. If both maximum and minimum readings are required, two auxiliary pointers are necessary, each independent of the other and having control knobs. The reason is that the "minimum" reading can only be set after the voltage is switched on. The same applies to ammeters when a minimum and maximum reading are desired. Given a constant voltage such ammeters can be calibrated in kVA or in kW provided that a domestic load and a power factor of unity are assumed.

Conduit does not give extra protection against fire risks. With the best class of cable properly run there is, as Mr. Fowler indicates, no risk along its length, for it will carry many times its rated load and will give ample warning by smoke and smell of serious overload, but cable in conduit may, under suitable conditions, actually give rise to fire risk by fusing its conduit covering over an appreciable length.

The modern exposed-cable main run could hardly be improved upon; in the sub-circuits numerous difficulties arise, nevertheless they are successfully dealt with. Hard rubber-sheathed cables, which Mr. Fowler does not mention, run exposed are far from unsightly and lie much more snugly than any conduit would do. The more cables are exposed to view in shipwork the better, from the electrical point of view and for the avoidance of fire risk. H. Camden MacEwan.

Belfast, *August 14th.*

Peak-load Stations

In your issue of August 10th, the writer of the leaderette on the above subject, while admitting the advantages of the Diesel engine in respect of quick starting, apparently threw doubts on the availability of units of sufficient output and suitable weight per b.h.p., and prices per kW for the conditions in question.

It is not clear what influence weight per horse-power may have on stationary power installations apart from the question of cost. It may be of interest to many of your readers to learn, what is not as widely appreciated as it should be, that the first cost of Diesel installations of moderate and large size has now reached a level of practical equality with steam plant. For example, a complete Diesel alternator installation consisting of say six 5,000-kW sets can be laid down to-day at a cost of £12 per kW including land, buildings, switchgear, auxiliaries, etc. The largest oil engine units at present running develop about 15,000 kW, but there is no difficulty in obtaining units of double this capacity if required.

British built units of this size can be obtained with every guarantee of reliable and economic operation, thanks to the experience gained with such machinery on large ocean-going vessels. A. C. Hardy.

London, E.C.3, *August 18th.*

The Progress of the Galloway Scheme

First stage nearing completion

THE work in connection with the Galloway water power scheme is being carried out in two stages, and, as Stage 1 is nearing completion, arrangements are now in progress for operations connected with Stage 2 to be started on a large scale. An important contract of over £220,000 has just been placed with Messrs. A. M. Carmichael, Edinburgh, who were also the successful contractors for major works in Stage 1, for the erection of two concrete gravity dams and stowaways across the River Ken, the construction of an approach canal, the laying of four reinforced-concrete pipes, the building of fish ladders and other works, and the foundations of the two power stations at Earlstoun and Carsfad.

There will be altogether five power stations erected in the valleys of the Deugh, the Ken and the Dee, and a feature of the undertaking will be the utilisation of the same water—the power stations will be practically in series mechanically, but will feed electrically on to the grid in parallel—from Loch Doon in the north to Tongland on the tidal waters of the Solway, draining a catchment area of nearly 400 square miles.

The superstructures of the two power stations built under the first part of the scheme, Glenlee and Tongland, are practically completed, and the generating sets are now being installed. It is anticipated these two stations will be in operation by the end of October. Glenlee is near the village of Dalry and is supplied from an artificial lake, 1,000 acres in extent, which, when full, will have a storage capacity of 7,900,000 gallons, or the equivalent of 12,000,000 kWh. The concrete dam is 1,500 ft. long and 75 ft. high.

A Long Tunnel Through Rock

From Clatteringshaws Loch, as it is now called, the water is led to Glenlee by means of a tunnel 3½ miles long cut through the rock 100 ft. below the hilltop. It is of horse-shoe shape and has a diameter of 11 ft. 6 in. A surge shaft has been cut out of the solid rock, 100 ft. high, just before the tunnel emerges to continue as a pipe-line down to the station. The object of this shaft is to serve as a safety-valve and water regulator, so that when the supply to the turbines has to be cut off for any reason the pressure will be relieved by the presence of this vertical outlet.

The pipe-line runs downward for about 1,500 ft. and branches into two electrically welded pipes, each 6 ft. in diameter, which will serve two turbines in the station. A tail race, 900 yds. long, has been cut to carry the waters from the power house to the River Ken.

The River Ken widens out gradually into Loch Ken, which will form a reservoir for the water supply for the Tongland power station. A barrage consisting of a dam with two sets of three sluice gates and a fish pass in the middle has been built at Glenlochar, three miles from Castle Douglas. The river, which on the lower end of Loch Ken joins with the Black Water of Dee and takes the name of the latter, is over 300 ft. wide at this point. Storage will be provided in Loch Ken for 2,000,000,000 gallons of water.

Tongland power station lies six miles farther down the river and is situated in a setting famed for natural beauty. The greatest care has been taken to preserve the distinctive charm of the surroundings. A dam of the horizontal-arch type has been built, the top standing some 70 ft. above the bottom of the gorge through which the river formerly ran. From the dam to the power house a covered concrete conduit, varying from 22 ft. to 18 ft. 6 in. diameter, has been built, and in a short time its existence will not be observed as the fill-over has been sown with grass.

A surge tower, to serve the same purpose as the surge shaft at Glenlee, but erected over the conduit in the open in the form of a steel tank 100 ft. in diameter and 80 ft. high, forms a conspicuous feature at the station. It has been painted to camouflage its otherwise stark appearance and does not appear unsightly.

The main storage reservoir for the three stations which are to be biult in the second stage, Kendoon, Carsfad and Earlstoun, will be provided at Loch Doon, which is to be raised 27 ft. above its present top level, and, when full, will hold 15,000,000,000 gallons, or the equivalent of 18,500,000 kWh. The River Doon drains the loch from its northern end at present and enters the Firth of Clyde at Ayr, and the outflow in that direction will still be maintained. To keep the new level up, water will be taken from the upper reaches of the Deugh Water and the Bow Burn by means of tunnels and aqueducts. The two main tunnels will be connected by a steel pipe-line, and water will be drawn from the loch in dry seasons back into the Deuch and Ken. Another reservoir is to be constructed at Fingland which will feed into the Blackwater Burn, a tributary of the River Ken.

Kendoon station will be built just below the junction of the Deuch and the Ken; dams on both streams will produce a common reservoir for the station. Carsfad will occupy a site a couple of miles farther down the Ken, and Earlstoun another two miles below Carsfad, each of the two stations having a separate dam on the Ken. The valley here runs alongside the high road from Dalmellington to Dalry, and the presence of these reservoirs, which will cover what is now rather bare grassland, should improve the appearance of the glen.

When the scheme is completed, towards the end of 1936, the five stations will have a combined output of 182,000,000 kWh per annum. The total cost of the undertaking is estimated at £3,000,000.

Automatic Diesel Sets

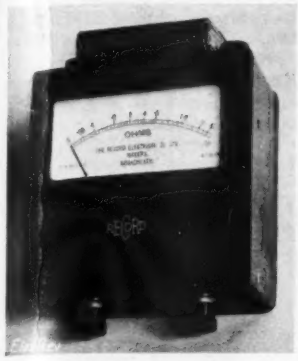
THE Diesel-electric generating sets developed by Petters, Ltd., Yeovil, embody special simplified features of automatic control which are said to be of value for country house and similar installations. The "Atomic" engine has an entirely machined combustion chamber which minimises the formation of carbon deposit. The combustion chamber is also of the "open" type without a secondary or pre-combustion cell which, in the ordinary way, has to be closed for starting and opened for running, thus needing additional electric automatic solenoids. There are no exhaust or inlet valves and the engine is directly coupled to a generator on a combined baseplate, a switchboard as a separate unit having the automatic gear enclosed in a glass front dustproof case, suitable for wall mounting. The operation of the set is controlled by the demand for current. The first few lights switched on use electricity from the battery, but when the load reaches a predetermined limit the automatic switchgear comes into operation, and the engine is started by the dynamo acting as a motor. When the demand falls to about 15 per cent. of the full load the automatic gear stops the engine. The sets are made in capacities up to 19 kW and no special house wiring or control switches are required.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Continuity Tester

A new small instrument has been designed by the RECORD ELECTRICAL CO., LTD., Broadheath, Altrincham, Cheshire, for the purpose of testing the continuity and measuring the resistance of metal conduit, lead sheathing, joints and bonding, etc., to comply with the new I.E.E. Regulations.



The Record continuity tester

The device has a true cross-coil ohmmeter movement and gives direct readings, independent of any variation in the battery voltage; consequently no compensating devices are necessary. Special features are the light weight (3¾lb. including battery) and its compactness (it measures only 4¼in. by 4¼in. by 2¾in.). The movement has a 3¼in. scale length reading 0 to 5 ohms and is fitted in a polished teak case, complete with a 4½-V battery which is clipped on the side ready for use, and can be easily replaced without interfering with internal connections.

A press key is provided on the instrument to close the battery circuit when testing, and also to prevent the battery from discharging itself when not in use. Any testing leads and spikes can be used, but their resistance should be measured by the instrument and their value deducted from the conductivity reading. The price of this new instrument is £3 17s. 6d.

A Fixed-connector Iron

Now that flexibles give but little trouble the FALKIRK IRON CO., Falkirk, deems it unnecessary to have plug connectors fitted to irons, and has introduced a 500-W 5½-lb. domestic iron, priced at 10s., which has a rigid sprung side-entry connector. The finish is nickel-plate and mottled enamel with an ebonised heat insulating handle. Six feet of flexible and a b.c. adaptor are supplied with the iron as standard.

The new "Falco" iron

An A.C. Transformer Lamp

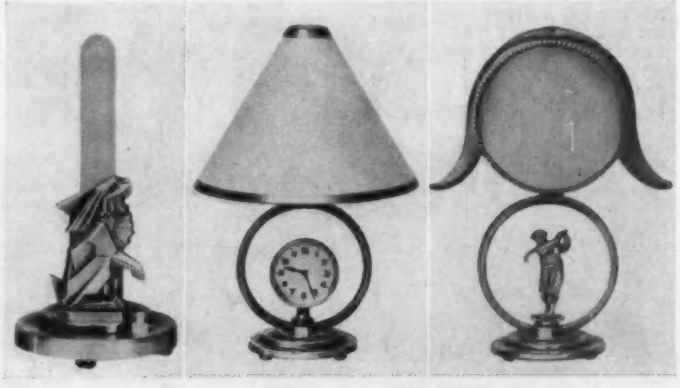
A novel device is being placed on the market in this country by the DAVIS ELECTRICAL CO., 15, Percy Street, London, W.1, which enables an ordinary 4-V, 2-W flashlamp bulb to be operated on 200-250-V mains; the overall length is only 3 in. It consists of a small transformer; externally, one end is formed into a bayonet cap for fitting into ordinary lampholders and the other end contains the flashlamp and nickel-plated reflector. The price of the standard model is 6s., and 100-150-V types are available at 10 per cent. extra, and Edison screw caps can also be obtained at a slight extra cost.

The "Deco" transformer lamp

Modern Table Standards

Included in a range of new "Walkerlite" table standards are the three models shown on the right. Both the tubular lamp style and those with the circular shades are available, depicting a cockerel, a dancing girl, a lady in an old-fashioned dress carrying a sunshade, or a girl piper, as well as with the golfer or rabbit as illustrated. The shade type is priced at 16s. 6d. in old brass or bronze, but oxidised silver and chromium plate are available at a slight extra cost. The silk shade costs 15s.

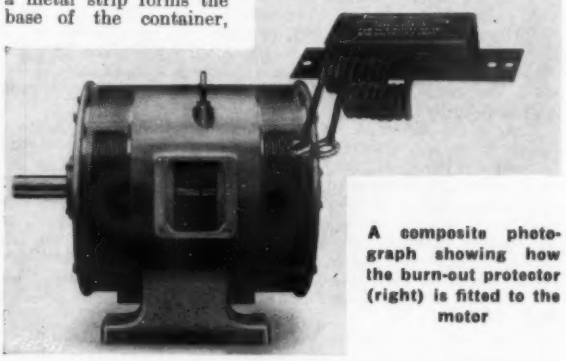
The tubular lamp style is equipped with a 30-W lamp; it costs 21s. in old brass or bronze (oxidised silver 21s. 9d., chromium 22s. 6d.), while the clock lamp, fitted with a 30-hour clock, is available in chromium plate only at £1, the parchment shade being 6s. extra. The fittings are made by the WALKER FENDER CO., LTD., Despatch Works, Sherborne Street, Ladywood, Birmingham, 16.



Three new "Walkerlite" table standards

A Burn-out Protector

The new English Electric burn-out protector consists essentially of a bi-metal operating element (which also forms the moving contact), and a fixed contact, enclosed in a moulded container of insulating material. It is very compact and measures 2¾ in. by 1¼ in. by 1 in. The contacts have tungsten tips, and a metal strip forms the base of the container, and extends past the ends of the moulding. The strip provides a means for securing the device and serves also to conduct the heat to the vicinity of the bi-metal element. The strip is very flexible and can be made to fit a curved surface. It is fixed to the moulding by four countersunk-head screws which are soldered over to prevent tampering with the internal parts of the protector. The connecting leads are of insulated flexible copper, each 18 in. long, and are provided with Ross-Courtney terminals.



A composite photograph showing how the burn-out protector (right) is fitted to the motor

The apparatus is designed for connecting in series with the low-voltage relay or other automatic trip equipment of motor control gear. All standard protectors are set to trip at 190 deg. F. and it is claimed that they operate accurately to within 3 deg. above or below. Any overload or stoppage in the motor ventilating system which causes overheating automatically cuts the current off through the relay, and the control gear cuts off the supply to the motor. It is then impossible to restart the motor until it has cooled down below the critical temperature.

The protector can be fitted on a stator coil or on the core behind the terminal box (as illustrated), or on any other part which has direct contact with either the stator core or the windings. The manufacturers, the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, state that it is suitable for a.c. machines of from 1 to 250 h.p.

An Electric Fire Alarm

A very moderately priced fire alarm has been introduced by ALEXANDER VICK, LTD., First Avenue House, High Holborn, London, W.C., known as the "Vick-Watch" fire alarm. It is sufficient for any normal enclosed space and the installation is quite simple. A special feature is its small size.

The apparatus consists of a tube containing a small charge of special compounded metal, this charge being sealed up by an impenetrable layer of grease, which prevents all oxidisation of the metal, so that it always remains the same active compound.

The special composition of the metal makes it possible for it to overcome the insulating effect of grease. When a fire breaks out, the metal is liquified, shoots through the grease,

forms a bridge across the contact points inside, and the alarm is given.

It is designed for connection to a bell circuit and will sound the alarm at 100 deg. F., although lower alarm temperatures can be provided for, according to customers' requirements. The watch can be obtained as a separate unit unconnected with the bell circuit, and a supplementary box containing a bell and battery which can easily be connected to all models of the watch can be supplied. The price is 5s.

Coloured Switchplates

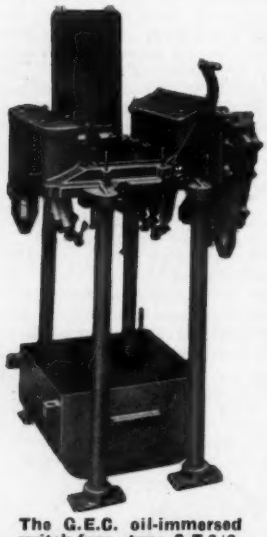
We are informed by MESSRS. S. O. BOWKER, LTD., Regent Row, Birmingham, that "Tenbyluxe" switchplates are now obtainable in a large variety of colours, including mottled blue, green or horn, mottled ivory and blue, light or dark blue, light, medium or dark green, pink or marble.

A High-voltage Rewirable Switch-fuse

A switch-fuse which the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has recently introduced, is designed to carry currents up to 100 A on three-phase 50-cycle systems up to 11,000 V, has a rupturing capacity of 75,000 kVA, and will withstand the most severe service conditions within its rated capacity.

Among the different forms that are made to meet various requirements are designs for either pole or floor mounting (the latter form being supplied with tubular legs, as shown in the illustration), a three-core cable box being provided on one side and either a similar cable box, a double box (for two three-core cables), three outdoor type porcelain insulators, or an adaptor chamber for bolting on to a transformer on the other. When used with a transformer the switch-fuse can be arranged so that after disconnection the transformer can be wheeled away without disturbing the switchgear or the h.v. cables.

Other forms which are available incorporate either a compound-insulated busbar chamber mounted above the switch-fuse to give an extensible form for building up into complete switchboards or, alternatively, oil-immersed isolators (equipped with earthing and testing terminals) and an additional three-core cable box for the tee-off circuit on ring mains, this form being non-extensible.



The G.E.C. oil-immersed switch-fuse, type S.F.3/2, arranged for floor mounting with the tank lowered and fuses in rewiring position

The complete unit consists of a strongly ribbed top casting, carrying the operating mechanism, the fixed contacts, and, on the underside, a welded steel oil tank which can be lowered for inspecting the contacts or cleaning the tank. The fixed contacts are of the line-contact controller pattern, while the moving contacts take the form of copper strips mounted on brass blocks, on the top of which are clamped the porcelain fuse holders, simple means being provided for anchoring the fuse wire to enable easy rewiring. The contacts for each phase are supported by bakelite beams coupled together with bakelised steel rods which are connected to the operating mechanism.

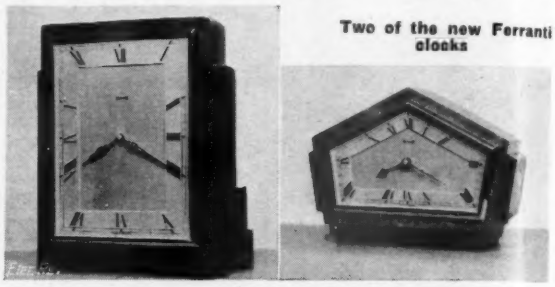
The fuse holders are clamped in position and provided with slots in the top and bottom, diametrically opposite each other, so as to direct the flow of the oil into the path of the arc under fault conditions, and, with the large head of oil provided, to make certain the rapid and safe extinction of the arc.

The operating mechanism is designed so that the moving contacts can not remain in an intermediate position, and springs ensure the correct speed of movement to break the full load current without risk of damage. An external operating handle is provided and can be locked in either an "on" or "off" position to prevent unauthorised operation; for pole-mounting the handle is mounted at a convenient height on the pole and coupled to the switch-fuse by steel tubing.

A special feature of the switch-fuse is the ease of rewiring the fuses, which can be carried out in absolute safety. The centre part of the top casting is provided with three narrow slots, normally closed by a mechanically interlocked hinged cover which, when the operating handle is in the "off" position, can be raised, thus allowing the fuses to move upwards until they project through the slots; the clamps securing the fuse holders can then be released, and the holders themselves withdrawn for rewiring, no tools being necessary.

Electric Clocks

A number of new electric clocks have been introduced by MESSRS. FERRANTI, LTD., Hollinwood, Lancs. They include a double-sided clock with chromium case, single tubular rod suspension and a modern artistic dial, similar to those which have been supplied to the Manchester Northern Hospital; a complete range of strut clocks, including twelve models all in chromium, and some of which may be obtained with alarm movement; a complete new range of wooden-cased clocks having larger dials, square, rectangular, pentagonal, octagonal, &c., in a variety of artistically modern wood cases; and a range of insertion clocks, the design of which allows them to be mounted in tiled fireplaces, wooden fireplace surrounds, or for any position where a flush fitting is desired.



Two of the new Ferranti clocks

Low-wattage Hairpin Filament Lamps

Concentric straight filament lamps rated at 200/260 V, 10 and 20 W, are being made by OMEGA LAMPWORKS, LTD., Rodney Place, Merton Abbey, S.W.19. A new method of mounting is employed so that one part of the filament is concentric to the other, and although the same length of filament wire is used, the angle of bending is much larger than where the whole filament is mounted at the same distance from the centre of the lamp. In some instances the supports are unusually long and are bent, giving increased resiliency and tending to decrease the strain.

Portable and Inset Fires

To meet the prevailing demand for cheap portable fires CARRON COMPANY, Carron, Falkirk, has introduced new cast-iron and sheet-metal models.

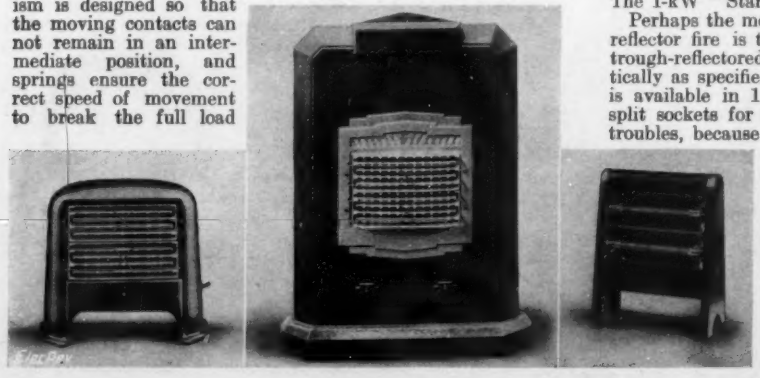
The "Sirius" cast-iron fire is made in 1-kW and 2-kW sizes, and although it is built on similar lines to the existing "Argus" pattern, it is of lighter construction, but with retained strength. Such essential features as the "Argus" terminal block with the iron-clamp cord-grip have not been sacrificed. As against the porcelain enamel of the "Argus," the "Sirius" is vitreous enamelled, and although this difference accounts somewhat for the lower price, the company is, in this respect, depending mainly on mass production.

The 2-kW model costs £1 3s. 6d. The sheet-iron "Star" (non-reflector) and "Starite" (reflector) fires are sprayed with synthetic lacquer enamels. The "Starite" (2-kW) is designed with a view to bedroom use for local warmth, and its cost of 27s. 6d. demonstrates the fact that a reflector adds to cost as well as to appearance, for the 2-kW "Star" is listed as 16s. The 1-kW "Star" is priced at 8s. 6d.

Perhaps the most interesting feature of the "No. 501" inset reflector fire is that it can be supplied with its separately trough-reflectored elements disposed either horizontally or vertically as specified. In vitreous enamel it costs £2 5s., and it is available in 1.5- and 2-kW loadings. The solid pins and split sockets for the plug-in elements overcome plug heating troubles, because of the better facilities for cooling the socket than the pin.

The "No. 520" wall-type surround and fire, with vitreous enamel finish, costs £2, and is loaded at 2-kW. It measures 17 in. by 3 in., by 23 in. high. In the "No. 521" floor-type surround and fire, the same design of fire proper is employed and is detachable from the surround, so as to render it easier for connection electrically. Loaded at 2-kW it costs, in "Carrontine" lacquer finish, £2 10s.

All the inset fires have a sheet-steel fitting box to which the cast-iron front is attached by claws and a clamping screw, and they are all fitted with d.p. switches.



Three of the new Carron fires: The "Sirius," "No. 521" inset, and the "Starite," each loaded at 2-kW

British Overseas Electrical Trade

Exports and imports substantially higher in July

A SATISFACTORY position is revealed in the Board of Trade returns for July so far as electrical exports were concerned. The total value of shipments of electrical goods, apparatus and machinery at £902,024, represented an increase of £186,423 (or 26 per cent.) as compared with the corresponding month of 1933.

The principal contribution to this increase was made by electric motors, with a rise of 142 per cent., while insulated wires and cables were also of a considerably greater value, the increase in this case being 40 per cent. Radio and telegraph and telephone apparatus and convertors and transformers were other items which helped to raise the total.

The only item which showed a considerable decrease was large generators (over 200 kW), exports of which were reduced by 52 per cent. as compared with July last year. Switchgear and accumulators were also lower in value.

It will be seen from our analysis of exports by markets that South Africa was responsible for about half the increase in the total, the Union's purchases of electric motors being considerably greater.

The imports rose, proportionately, to a greater extent than exports (57 per cent.) mainly on account of increased radio imports, and unenumerated goods and lighting apparatus.

The principal destinations of the more important items shown in the smaller table were as follows, the July, 1933, figures being given in parentheses:—

Rubber-insulated wires and cables: Australia, £18,188 (£11,650); India, £16,140 (£12,578); South Africa, £14,799 (£12,000); New Zealand, £3,078 (£1,624); other British countries, £10,237 (£7,150); foreign countries, £6,853 (£8,922).

Electric wires and cables (insulation other than rubber): India, £20,896 (£14,740); South Africa, £19,546 (£16,938); Australia, £17,108 (£5,356); other British countries, £6,078 (£6,193); foreign countries, £14,585 (£8,280).

Telegraph and telephone apparatus (not radio): Australia, £14,901 (£2,948); South Africa, £14,248 (£20,561); Canada, £571 (£161); other British countries, £12,284 (£19,498); Argentina, £6,883 (£235); other foreign countries, £41,929 (£28,632).

The following analysis shows the sources of electrical imports into this country:—

Germany, £70,689 (£54,219); Netherlands, £64,804 (£31,897); United States, £42,769 (£20,515); Switzerland, £17,928 (£13,464); France, £17,563 (£6,552); Belgium, £4,793 (£11,553); Austria, £3,202 (£5,311); British countries, £14,349 (£5,862); other foreign countries, £32,852 (£26,962).

Vacuum cleaners were supplied by the following: Canada, £6,083 (£1,860); Sweden, £3,813 (£3,334); United States, £1,926 (£417); Germany, £75 (£810); other foreign countries, 1,428 (£1,211).

EXPORTS AND IMPORTS DURING JULY

	Exports. July, 1934.	Exports. Inc. or dec. compared with July, 1933.	Imports. July, 1934.	Imports. Inc. or dec. compared with July, 1933.
Submarine telegraph and telephone cables	£2,506	+ £1,081	*	—
Telegraph and telephone wires and cables (not submarine)	31,686	+ 13,482	*	—
Other insulated wires and cables	147,508	+ 42,077	£13,410	— £4,635
Radio receivers (excluding valves)	14,028	— 306	10,307	+ 5,144
Radio transmitters (excluding valves)	8,964	— 589	*	—
Radio valves	28,790	+ 13,140	7,121	— 4,389
Other radio parts and accessories	36,396	+ 17,296	70,244	+ 38,942
Telegraph and telephone apparatus (other than radio)	90,816	+ 18,781	*	—
Electric carbons	*	—	19,940	+ 9,604
Incandescent lamps	45,658	+ 11,912	14,242	— 7,263
Other lighting apparatus	27,640	+ 3,690	40,498	+ 20,478
Primary batteries	15,067	— 1,300	150	— 124
Accumulators	34,299	— 7,769	*	—
House service meters	13,177	+ 3,891	*	—
Other electrical instruments	14,658	+ 407	24,753	+ 2,857
Unenumerated electrical goods and apparatus	110,094	+ 25,096	68,284	+ 32,020
Electric generators up to 200 kW	14,886	— 1,393	*	—
Electric generators over 200 kW	27,596	— 30,096	*	—
Electric motors	119,147	+ 64,033	12,882†	+ 4,600
Convertors and transformers	33,299	+ 18,522	*	—
Starting and controlling gear for motors	16,500	— 28	*	—
Switchgear	60,342	— 5,632	*	—
Other electrical machinery	8,967	— 652	16,082	+ 10,308
Electric vacuum cleaners	*	—	13,325	+ 5,668
	£902,024	+ £186,423	£311,238	+ £113,190

* Not classified separately. † Not railway and tramway motors.

BRITISH ELECTRICAL EXPORTS DURING JULY

Destination.	Goods and apparatus, July, 1934.	Inc. or dec. compared with July, 1933.	Electric generators, July, 1934.	Inc. or dec. compared with July, 1933.	Motors, July, 1934.	Inc. or dec. compared with July, 1933.	Other electrical machinery, July, 1934.	Inc. or dec. compared with July, 1933.
Irish Free State	£21,629	+ £8,393	*	—	*	—	*	—
Union of South Africa	105,712	+ 16,407	£23,200	+ £21,071	£56,216	+ £43,495	£37,766	+ £11,478
British India	88,185	+ 7,770	4,332	— 9,818	13,986	+ 6,308	29,449	+ 9,406
British Malaya	13,241	+ 3,328	*	—	*	—	2,559	+ 2,049
Ceylon	4,466	+ 1,306	*	—	*	—	*	—
Hong Kong	2,800	— 16,032	*	—	*	—	*	—
Australia	87,760	+ 48,233	2,724	— 30,792	5,192	— 4,676	4,959	— 6,663
New Zealand	29,062	+ 7,178	*	—	1,628	+ 461	2,389	+ 1,073
Canada	4,960	— 154	79	— 106	2,661	+ 1,076	3,425	+ 2,504
Other British Countries	33,839	+ 15	2,222	— 3,107	5,881	+ 434	10,043	+ 1,840
Sweden	20,087	+ 15,179	*	—	*	—	*	—
Denmark	7,269	+ 3,379	*	—	*	—	*	—
Belgium	10,954	+ 3,988	*	—	*	—	*	—
France	9,469	— 1,660	*	—	*	—	2,033	— 625
Spain	7,658	+ 5,941	*	—	*	—	*	—
Italy	26,058	+ 6,816	*	—	*	—	*	—
Greece	3,264	+ 1,705	*	—	*	—	*	—
Egypt	13,749	+ 8,535	*	—	*	—	213	— 295
China	10,082	+ 817	*	—	*	—	4,128	— 2,748
United States	2,140	+ 669	*	—	*	—	*	—
Argentina	36,519	+ 24,803	*	—	463	— 2,027	651	— 12,464
Soviet Union	*	—	575	— 1,331	8,450	+ 7,958	310	— 174
Netherlands	*	—	59	— 247	*	—	1,202	— 582
Other Foreign Countries	82,384	— 4,947	9,291	— 7,159	24,670	+ 11,004	19,981	+ 7,411
Total	£621,287	+ £141,669	£42,482	— £31,489	£119,147	+ £64,033	£119,108	+ £12,210

* Not classified separately.

New Books

Design of Electrical Machinery. By H. COTTON. Pp. 479; figs. 212. London: Oxford University Press. Price 24s.

Treatises on design are apt to be heavy and bulky. Prof. Cotton's new work is no exception, but there is no padding of maker's photographs, nor descriptive material, to account for this.

The book opens with notes on the materials of construction. These are useful, though a few oddities occur, such as: "baking at 120 deg. C. . . . and drying at 180 deg. F." Windings come next. Lap windings having more circuits than poles, we learn, are used on large machines; and later on we are told that such windings are in common use with every success. We had almost said: "We do not believe it." In any case, many designers would like full details. Again, to say that in British and American practice series-parallel windings are avoided whenever possible is too sweeping, and withholds credit from many designers in this country who employ wave windings with more than two circuits (symmetrical, of course) whenever their use is justified.

Further on, in the chapter on design of d.c. machines, the author himself, after stating the conditions for symmetry, chooses an 8-pole wave winding with four circuits in preference to a 6-pole lap winding with two turns per coil. To judge from a footnote, however, his conscience is made none too easy thereby. A designer is on far safer ground, both economically and technically, when he first makes sure of his theory and then sticks to it. Nevertheless, in various chapters, much good information on windings is given, though it would have been better to concentrate it in one chapter.

Making electrical design an academic subject is a difficult matter. The writer or teacher seeks to find some rule—often empirical—which the student can hang on to. Memory, rather

than reasoning, has soon to be relied on, with the added complication of meaningless formulæ. Furthermore, experience, the essential feature of successful design, is entirely lacking in the student; while in many teachers it is either forgotten or out of date—assuming, of course, that it was ever there. Dr. Cotton does well to emphasise the fact that commercial design may be very different from that taught in classes. A student must not be surprised to be told that an admirable textbook on design may have but limited value in the works. Fortunately, authors are showing an increasing appreciation of this fact.

The machines dealt with by Prof. Cotton include d.c. machines, transformers, alternators, induction motors and rotary convertors. Along with design, there is an adequate discussion of theory and action, without going too much into technology. In a final chapter on additional examples the author breaks away from the more standard work and includes a variable-speed shunt motor, a d.c. traction motor, a low-voltage exciter, a 10,000-V d.c. generator, a small aircraft generator, a waterwheel alternator, a 150-kV testing transformer, a 678-h.p. 1,475-r.p.m. induction motor, a 405-h.p. 1,500-r.p.m. synchronous-induction motor, and so on—altogether a goodly collection of useful material.

The book is well produced, though thick paper makes it rather heavy; also, some of the diagrams do not reveal the lettering of the expert draughtsman. Such small adverse criticism, however, is negligible compared with the praise due to the author for much hard and useful work.

Voltage Regulation on A.C. Systems. By J. L. ROWBOTHAM and T. F. ALTHAM. Pp. 151; figs. 89. Walton-on-Thames: Hackbridge Electric Construction Co., Ltd. Price 5s.

This book is, so far as we are aware, the first to deal exclusively with voltage and phase regulation and should, on that account alone, be sure of a wide circulation. Although issued under the auspices of a leading manufacturer, it is not a piece of individual propaganda.

The need for closer regulation on transmission and distribution systems, in view of the adverse effects of voltage variation on load development and the suppression of the idea that the requirements can be met by the use of heavy copper, makes its appearance most timely.

The arrangement of the sections is logical, starting with a survey of the requirements of modern electricity supply systems, and going on to discuss the principles that decide the best positions on the network for regulators (this is important, since indiscriminate installation of this class of gear may cause more trouble than it avoids). The chapter on phase-angle control, which requires equipment similar to that for voltage regulation, will be especially useful to those responsible for station and system interconnection.

The longest section is devoted to types of apparatus, and is followed by others on automatic control and on specifications, which includes a note of the most important items to be considered in the choice of a regulator. Most of the illustrations are diagrams which enable the reader to follow the authors' points easily, and vectors are introduced intelligently when their use elucidates the theory of design and operation.

Theorie der Elektrizität. By R. BECKER. Pp. 262; figs. 59. Leipzig: B. G. Teubner. Price Rm. 14.50.

The eighth edition of this book was reviewed in our issue of November 14th, 1930; this notice deals with the tenth edition. It is hardly necessary to give further evidence of its popularity in Germany. The general form of the book remains unaltered, the main sections being as before—vectors and vector fields, the electric field, the electro-magnetic field, and the application of the Maxwell theory to energy and power. There is also a useful summary of the formulæ and nomenclature.

In the new edition the principal addition is a collection of 100 examples based on the principal sections, with their solutions. Modifications in the text are of a minor nature and are designed to clarify the treatment, especially of the sections dealing with the demagnetising factor and the propagation of waves on conductors with definite resistance.

In the previous review a warning was given that the book is, for the most part, accessible only to advanced students of mathematics. This position has not changed, although the inclusion of practical examples makes it somewhat simpler to extract the real essence of the subject. The general production of the book is still on the extremely high standard of previous editions, and it can be recommended with complete confidence to serious students of German and electrical theory.

Radio Receiver Measurements. By R. M. BARNARD. Pp. 116; figs. 53. London: Iliffe & Sons Ltd. Price 4s. 6d. net.

There is still much vagueness in the standards of performance of broadcast receivers, and the object of this book is to suggest means for dispelling this. For several years criteria have been used by certain manufacturers, but the testing apparatus has been specialised and expensive. Recently, however, several firms have produced cheaper apparatus more suitable for the amateur experimenter, and it is for him as well as for the professional that this book has been written.

The author, who is chief inspector of broadcast receivers for Standard Telephones & Cables, Ltd., first sets out the requirements of a receiver, and having considered various types of local testing oscillators describes how these can best be used for the measurements required, *i.e.*, sensitivity, selectivity, fidelity and volume control, and how the results should be interpreted in estimating performance. The matter, which is right up to date, is set forth concisely, and a useful summary concludes each chapter. It is pointed out that correct interpretation of the measurements requires skill and experience; the poor reproduction of the earlier receivers is considered to have been due more to the presence of resonances and amplitude distortion than to an early cut off.

This book should be valuable not only to service engineers for whom it is primarily intended, but also to other technicians whose work is connected with the design and performance of broadcast receivers.

Alternating Currents. By LEO T. AGGER. London: Macmillan & Co., Ltd. Pp. 204; figs. 146. Price: 5s. net.

Even an elementary knowledge of alternating current cannot be obtained without the aid of a certain amount of mathematics, including trigonometry. The author of this book, which has been written for first year students, evidently realises that his readers are likely to be weak in mathematics, for he uses only the simplest mathematical treatment and in this he succeeds admirably. Mr. Agger has the gift of expressing what may be really complex ideas in simple and easily understandable language, this being particularly noticeable in his treatment of such subjects as "root-mean-square" values, vector representation and so on. We like also the manner in which he works out one or two numerical examples at the appropriate place in the text, as these form a valuable guide to the exercises which are included (with answers) at the end of each chapter.

We would, however, like to break a lance with him over the sequence of his chapters and in one or two instances over his choice of subject-matter. Alternating current electricity is admittedly of great practical importance and an endeavour should be made at the outset to point out its advantages as compared with d.c. (the student is assumed to have a certain knowledge of the latter) and then to give a brief outline of modern practice in the generation, distribution and utilisation of alternating currents. Once the student has a grip on the practical side of any branch of engineering science, he takes far more kindly to the study of the theoretical side and is, moreover, able to understand it far more readily.

The same criticism can be urged against the subject-matter of the descriptive chapters given at the end of this book. Here the author deals with a low-speed fly-wheel type of alternator instead of the four- or two-pole type such as is employed in modern power station practice for direct coupling to a turbine running at 1,500 or 3,000 r.p.m. Similarly, in dealing with the a.c. motor, he is content to consider only the induction type, neglecting the synchronous and commutator types.

In the theoretical aspect the book is remarkably well done but to give the student a true insight into the subject, a rather more practical treatment is advisable.

Thermionic Emission. By ARNOLD L. REIMANN. Pp. 324; figs. 64. London: Chapman and Hall, Ltd. Price 21s.

There has been an outstanding need for a comprehensive work on the subject of thermionic emission which the present book should go a long way to satisfy. The great advances in high-vacuum technique which have been made in recent years, together with a better understanding of the underlying processes, have done much to bring about greater accord in the results of various workers. As a result of this the theory has advanced considerably, although many of the processes are, to say the least of it, still obscure. One of the most valuable features of the work under review is the manner in which discordant results and conflicting views are put forward, and a considered opinion of all the evidence given.

The book is divided into six rather long chapters, the first of which gives a general survey of the whole field of thermionics. Chapters II, III and IV deal with electron emission from clean metals, contaminated metals and oxide surfaces respectively, whilst the modern theory of electron emission is treated in chapter V. Finally, in chapter VI an account is given of the thermionic emission of ions from electrolytes and metals. Two valuable features of the book are the extensive bibliography arranged at the end of each chapter and the inclusion of a great deal of hitherto unpublished work.

The book is essentially one for the specialist in the field of thermionics, whether he be interested in the subject from the academic or technical points of view. It should be of immense value to research workers in thermionics and especially to those entering freshly into the field; but readers who expect to find information relating to technical applications of the subject will be disappointed.

* * *

Shorter Notices

The Institution of Engineers, Australia, has published "Engineering Drawing Practice" (108 pp., 4s. 6d.). Nominally a second edition of "Mechanical Drawing Standards," published in 1926, the scope of the book has been extended to cover the drawing practice of all the main engineering branches. The text has been re-written and new drawings and diagrams have been added.

"Wireless for the Man-in-the-Moon," by "Coulombus" and "Decibel." (Pp. 128, illus.) London: George Newnes, Ltd. Price 2s. 6d. A humorous exposition of the art of wireless.

"Everybody's Electricity," by C. L. Boltz. Pp. 208; figs. 106. London: G. G. Harrap & Co., Ltd. Price 3s. 6d.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures

Trade with East Africa

The Department of Overseas Trade has published a report on economic conditions in East Africa by Mr. C. Kemp, Trade Commissioner in the territory. (Stationery Office, 3s. 3d. net.) The countries comprised in East Africa are the Uganda Protectorate, Kenya Colony and Protectorate, Zanzibar and the Tanganyika Territory, and the period covered by the report is the two years ended in March last. It is obvious that economic conditions vary, as between the different constituents of the territory. For instance, while Uganda is comparatively favourably situated the state of the other areas is still unsatisfactory. These markets have been flooded with cheap goods, largely from Japan, but there is a redeeming feature in this: it has encouraged natives to become purchasers of imported goods and to endeavour to extend their purchases. It is considered that there are too many interests competing for the limited amount of business available; this has led to a reckless granting of credit with resultant losses to those responsible for it.

While there have been reductions in most classes of imports there have been several notable exceptions. Machinery imports have shown a considerable recovery, due largely to mining activities in Kenya and Tanganyika. Imports of electrical machinery and parts rose from £23,864 in 1931 to £32,048 in 1932 and £43,201 in 1933. By far the largest proportion of this is British (£17,018 in 1931, £31,940 in 1933). Belgium, Germany and the United States are also suppliers, but the share of the U.S. fell from £3,795 in 1931 to £555 last year. The best market is the Tanganyika Territory. There was a considerable decrease in imports of other electrical goods in 1932 as compared with 1931 (£65,443 against £100,177), but in 1933 there was a slight recovery to £68,966. Here again the United Kingdom has the bulk of the trade; Germany and the United States also secured a share. Radio apparatus imports also declined considerably in 1932 but recovered to some extent last year when the total value was £12,259. An improvement in business is expected with better transmission arrangements in India and the home countries, but Continental and American competition is likely to be intensified in the near future as trade becomes more plentiful.

North Eastern Campaigns

We have received from Redheads Advertising, Ltd., 19, Saville Row, Newcastle-upon-Tyne, a series of examples of Press advertisements prepared by them in co-operation with Mr. S. G. Pike, advertising manager of the North Eastern Electric Supply Co., Ltd., for promoting electric cooking and water heating business. The designs in these two sets are brought together in a suitable folder, carrying the title "Commonsense Selling of Electricity." An article relating to the North Eastern Company's cooking campaign methods, and the general advertising and publicity literature employed in connection therewith appeared in the *Advertisers' Weekly* for August 9th. It is stated that the results justified the policy behind the campaign and led the North Eastern Company to embark on its water heating advertising scheme which is now running.

Dutch Import Quotas

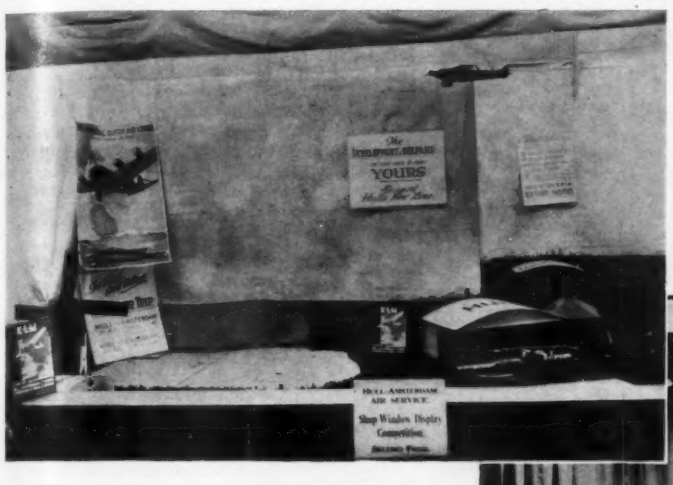
The *Board of Trade Journal* gives a list of import quotas for the United Kingdom covering the year to July 31st, 1935, fixed by the Netherlands Government. This includes electric vacuum cleaners (2,071), insulated electrical conductors (18,602 kg.) and electric incandescent lamps (110,593).

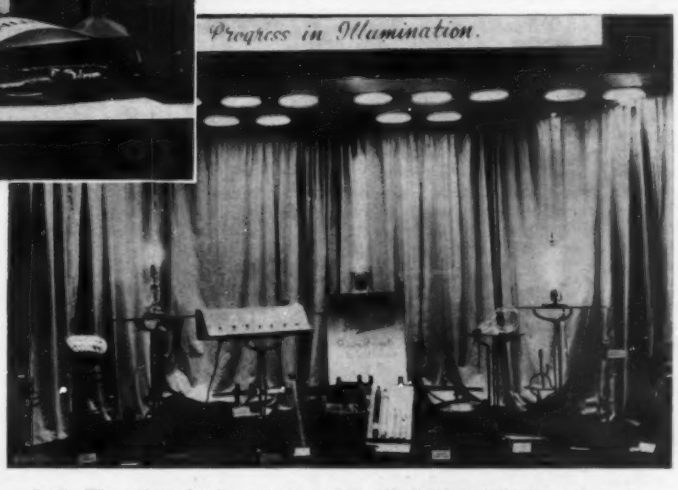
Local Exhibition

Cannock Urban District Council Electricity Department proposes to hold an electrical exhibition at the Queen's Hall, Cannock, in October.

Window Displays at Hull

During recent months there has been great window-dressing activity at Hull and several competitions have been held. In these the City Electricity Department has played its part and during the Civic Week secured a prize for a display staged in its showroom windows. Mr. J. N. Waite, the city electrical engineer, informs us that lately special attention has been given to air-transport development in the city consequent upon the inauguration of the K.L.M. Liverpool-Hull-Amsterdam service. The local Development Committee organised a window-display competition in connection with this and the K.L.M. concern offered three prizes; the Electricity Department entered and won the second prize (an air trip to Amsterdam) with the display illustrated herewith. The window included a wooden model of an air liner (made by the Department) moving in clouds. This was done by means of an ordinary train rail to which the model was fixed. At the same time special displays were made in the other windows one of which, demonstrating progress in illumination, is also illustrated.





Left: The prize-winning window of the Hull Electricity Department. Right: Another display arranged by the department

A Hospital Installation

The Bernhard Baron Hospital at Papworth, one of two which have been erected at Papworth Village Settlement, was opened recently by the Duke of Gloucester. Both hospitals are fitted with every convenience. All wards are equipped with a light, bell-push, wireless socket and switchplug for every bed; and the men's hospital is fitted with an X-ray room containing the most modern equipment available. Each hospital has its own "Keepalite" emergency lighting equipment, which has also been arranged to keep the bell systems in operation should the mains fail. Altogether, over twenty-one miles of Henley cables have been used in these two buildings, the whole of the electrical installations having been carried out by the St. Neots branch of Messrs. Christy Bros. & Co., Ltd., of Chelmsford.

The Belgian Electric Cooker Market

The Commercial Counsellor to H.M. Embassy, Brussels, has forwarded to the Department of Overseas Trade information regarding the Belgian market for electric cookers. Until recently the use of electric cooking and other household utensils has been relatively small in Belgium. In the last few months some of the Belgian central power stations have, however, started to encourage the use of electrical apparatus for household purposes. With this aim in view, they have established special tariffs for electric cookers, water heaters, etc., and an active propaganda campaign has been carried out by direct canvassing of the public, public lectures with practical demonstrations, exhibitions, etc. Successful results have been

reported from Courtrai and neighbouring villages, Malines and Verviers. It would appear that, taking into account the density of the Belgian population, an interesting market for electrical goods remains open. Cookers of United Kingdom manufacture are different from the Continental types, but the difference does not seem to be such as to prevent an easy adaptation. The primary question is that of the spacing between the boiling plates. The cooking pans used in Belgium are wider at the top than at the bottom. The distance between the rings should therefore be at least 8 cm. (3.4 in.). Further, the legs of the cooking ovens should be shorter. The total height of the cooker should be approximately 80 cm. (2 ft. 10½ in.). Two local makes are very well known in Belgium, but they are considered to be of far lower quality than cookers of United Kingdom manufacture. A higher price can be obtained for the latter on account of their superiority. It is complained that some United Kingdom manufacturers use extremely heavy wooden cases for the packing of their electrical apparatus for export, thus increasing the transport charges, which are already considered rather high. German firms apparently use strong cardboard boxes. It is considered that the best method of entering the Belgian market is to deal solely with power stations or power distributing companies. It is not advisable to deal with electrical wholesale or retail merchants, who are not in a position to carry out similar propaganda to that conducted by the distributing companies which are in regular contact with the individual consumer.

A Tableau by the Woking Electric Supply Company

Registered Electrical Contractors

Applications from the following for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at a meeting on August 10th :—

Bremner Bros., Forfar.
Evans, W. E., Weaste, Salford.
Riding, F. F., Blackburn.
Lewis & Daniels, Hale.
Domestic & Commercial Electricity (Hull), Ltd.
Glide, J. M., Taunton.
Ayliffe, V. A., Didsbury, Manchester.
Hewitt, T., Prestwich, Manchester.
Wright, E., & Son, Dover.
Bell, A., Perth.
Richards, V. J., Birmingham.
McCowan & Guild, Perth.
Bampton, F., Manchester.
Spalding U.D.C., Electricity Department.
Badman & Co., Weston-super-Mare.
Jones, A. E., Manchester.
Failsworth Industrial Society, Ltd., Newton Heath, Manchester.
Hare, L. A., Manchester.

At the same meeting three applications were withdrawn and nine were declined.

For Sale

The Gainsborough U.D.C. Electricity Department invites offers for three transformers and one induction regulator, complete with automatic equipment.

The Brighton Corporation invites offers for two 300-kVA 3,000/400-V indoor-type transformers.

(See our classified advertisements.)

Classes in Industrial Subjects

Two courses, each of ten discussion classes, have been organised by the National Institute of Industrial Psychology, to be held at its offices in Aldwych House, Aldwych, London, W.C.2. The subject of the first course is "The Engagement, Training and Supervision of Workers," and the classes will be held on Tuesday evenings, starting on October 2nd. The course is planned for labour managers, departmental managers, welfare superintendents, foremen and forewomen. The second course is concerned with "Conditions and Methods of Work," and these classes also will be held on Tuesday evenings, starting on January 15th, 1935. This course is for managers, technicians with administrative functions, foremen and forewomen. A synopsis of the courses and full particulars can be obtained from the Secretary of the National Institute of Industrial Psychology, Aldwych House, W.C.2.

Utility and Beauty

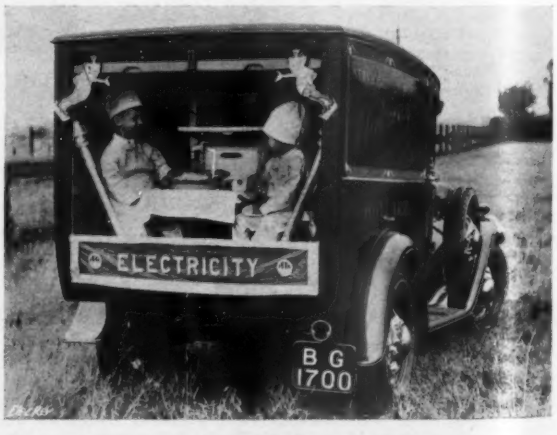
This seems to be an appropriate description of a tableau entered in a recent hospital carnival procession by the Woking Electric Supply Co., Ltd. (resident engineer: Mr. Fitzroy Woods). The tableau, which was awarded a prize, demonstrated the "all-the-year-round" usefulness of electricity, the centrepiece consisting of four panels representing the seasons, against each of which was an appropriate appliance—a vacuum cleaner for spring, a refrigerator for summer, a cooker for autumn, and a "Magicoal" fire for winter. The four young lady attendants—members of the staff—were appropriately garbed.

Chinese Import Duties

A number of classes of electrical goods are affected by the new Customs tariff which was put into force by the Chinese authorities as from July 3rd. According to the *Chinese Economic Bulletin*, electrical machinery for the generation and transmission of power, such as dynamos, motors, transformers, &c., and parts, are now subject to the following duties (the previous rates being shown in parentheses): (*a*) Dynamos and motors not over 20-kW capacity and transformers not over 200-kVA capacity, 15 per cent. *ad valorem* (7½ per cent.); (*b*) others, 10 per cent. (7½ per cent.). Other electrical apparatus is subject to duties as follows: Bulbs, 4 gold units per 100 (gold unit=19.73d.); cleats, insulators, ceiling roses, plugs, sockets, switches, switchboards, &c., 25 per cent. (20 per cent.); cords, wires, cables and all other electrical materials not otherwise provided for, 20 per cent. (15 per cent.); cookers, fans, flashlights, irons, lampware, radiators, toasters and similar appliances and parts, and accumulators, batteries, condensers and parts, 25 per cent. (20 per cent.); ammeters, voltmeters, wattmeters, &c., 10 per cent. (7½ per cent.). Radio sets and parts are subject to duties ranging from 15 to 25 per cent. (12½ to 20 per cent.), while the rate for other telegraph and telephone apparatus is 15 per cent. (12½ per cent.). The duty on prime movers, combined with generators or not, and on steam boilers, economisers, superheaters, mechanical stokers and other boiler-room accessories is 10 per cent. (7½ per cent.).

A Prize Tableau

Two very youthful cooks and an electric cooker formed the main attraction of a tableau entered in a recent local carnival by the Hoylake electricity undertaking (engineer: Mr. C. J. Turner). The vehicle was a handsome service van which the department employs; the first prize was secured by the display.



A Hoylake carnival entry

World Production of Aluminium

The Metall Gesellschaft of Frankfort-on-Main has published its annual statistics regarding world production of non-ferrous metals. In the case of aluminium it is shown that the production reached its maximum at 276,800 tons in 1929 and then declined to 267,000 tons in 1930, 219,300 tons in 1931, 153,500 tons in 1932, and further to 141,500 tons last year. The fresh diminution which took place in 1933 is noteworthy having regard to the fact that consumption actually increased from

141,300 tons in 1932 to 162,000 tons last year, and compared with 175,700 tons in 1932, 209,700 tons in 1930, and 276,000 tons in 1929. Taking the index number of the price of aluminium at 100 for the years 1909-1913, the index number in Germany was 118 in 1931 and 111 in 1932 and 1933. On the other hand the index in New York was 104 in 1931 and 1932 but only 84 in 1933 on the basis of the quotation converted into gold currency.

Trade Announcements

Messrs. George H. Scholes & Co., Ltd., have removed to Wylex Works, Wythenshawe, Manchester (telephone: Didsbury 2471-2).

Mercury Electrical Appliances, Ltd., 71, Dunlop Street, Glasgow, have removed to larger premises at 60, Oswald Street.

Mr. F. L. Smith has opened a new electrical and radio showroom at 119, Wellgate, Rotherham.

Messrs. J. F. Irvine & Co., Ltd., wholesale electrical suppliers, opened new electrical showrooms last week at 2, Shore Terrace, Caird Hall Buildings, Dundee.

The Medical Supply Association, Ltd., 167-173, Gray's Inn Road, London, W.C.1, is shortly opening new showrooms at 95, Wimpole Street, W., for the convenience of practitioners in London's medical centre. The new premises are opposite the headquarters of the Royal Society of Medicine.

Owing to the rebuilding of the Town Hall at Luton, Messrs. R. J. Stearn & Co., electrical and radio engineers, have removed their business at Manchester Street to their branch at 19, Upper George Street.

Effective Display Boards

Messrs. Ward & Goldstone, Ltd., Frederick Road (Pendleton), Salford, have sent us a pamphlet describing their latest "Goltone" display boards. These boards, which are attractively designed, are supplied gratis to stores, contractors and dealers, only the accessories being charged for. They are suitable for either window or counter use. The range comprises boards for bell accessories; ivory-white bed and bathroom fittings; hand-lamps; electric torches; brown- and walnut-finished accessories (a varied selection of switches, adaptors, &c.); pocket lamps; conversion attachment for bedside switches; dim and bright light conversion attachment; and radio wires.

A "Goltone" display board

Employment During July

The *Ministry of Labour Gazette* states that employment in general and electrical engineering continued to improve during July. In the engineering industry as a whole the number of unemployed was reduced by 926 to 131,706, or from 13.9 per cent. in June to 13.8 per cent. The proportion in July, 1933, was 22.9 per cent. The electrical section reported a decrease to 6,720 in the number of unemployed, reducing the proportion from 8.0 to 7.4 per cent. (14.4 per cent. in July, 1933). In the electric cable, wire and lamp manufacturing group the unemployed figure was reduced from 9.1 to 8.2 per cent. (12.6 per cent. in July, 1933), the actual number being 10,260. There was a rise in unemployment in the electrical wiring and contracting industry from 17.4 to 19.2 per cent. (18.8 per cent. in July, 1933), the total being 5,313.

Recent Contracts

At Walton Hospital, Liverpool, there are already three Browett Lindley-G.E.C. steam engine-driven generators, and as more power is now required for the increasing load an order has just been placed for a further steam engine-driven generator of 200-kW capacity from the same makers. The new Browett Lindley engines will be of the two-crank, two-cylinder, compound, forced lubricated, vertical double-acting, two-valve type and arranged to exhaust at 5-lb. pressure, thus supplying steam for heating and for process work in the laundry and elsewhere in the hospital. The pistons are fitted with special bronze restrained-type rings, enabling the engine to work entirely without cylinder lubrication to guard against contamination of the exhaust steam. Each cylinder is self-contained with its own piston valve directly in line over the crankshaft, thus ensuring greater flexibility of valve settings. The G.E.C. generator is of that company's standard open-type design, and complies fully with the appropriate British Standard Specification. The equipment is being supplied to the specification of Mr. H. Cleverley, the chief engineer to the hospital. The three sets already installed have been giving satisfactory service since 1922.

Following the recent announcement that Belfast Corporation has ordered fifty tramcar equipments of the "Crompton-West" type, it is now announced that further orders have been placed with the "Crompton-West" organisation by the Sunderland Corporation for three car sets of equipment and by the Liverpool Corporation for fifty car sets. The Sunderland order is a fourth repeat, and the Liverpool a third repeat; the latter order covers fifty sets of four-motor equipments, together with controllers, circuit-breakers, &c. The order has been received in conjunction with the E.M.B. Co., Ltd., which is supplying the trucks and air-brake equipment. The motors will be made at the Chelmsford works of Messrs. Crompton Parkinson, Ltd., and the controllers and circuit-breakers by Messrs. Allen West & Co., Ltd., Brighton.

Dumfries Demonstrations

A specially equipped coach has been used during the past fortnight by the Dumfries County Council Electricity Department to give demonstrations of various electrical utensils and apparatus throughout the county.

Prices of Materials

Messrs. F. Smith & Co. report, August 22nd: No change in the price of electrolytic copper bars, wire rods and h.c. wire and silicium bronze wire.

Messrs. James & Shakespeare report, August 22nd: No change in the price of copper bars (best selected), sheet and rod and English pig lead. Electrolytic copper sheets, £30 15s. to £31 5s., £1 5s. decrease.

Messrs. Edward Till & Co. report, August 22nd: No change in the price of india-rubber, Para fine.

New Catalogues and Lists

Carron Company, Carron, Scotland.—A catalogue of the new season's fires.

Ward & Goldstone, Ltd., Frederick Road, Salford.—A complete 1934/5 radio catalogue.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.—Leaflets on "Ediglos" flexibles and "Ediswan" 2V accumulators for radio use.

G. Green & Co., "Gee-Gee" Works, Chapel Road, West Norwood, S.E.27.—A leaflet dealing with "Gee-Gee" immersion heaters.

Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1.—A booklet describing "Duo-Dome" reflectors.

Mullard Wireless Service Co., Ltd., 111, Charing Cross Road, London, W.C.2.—The Mullard radio valve guide for the 1934/5 season.

Hopkinsons, Ltd., Britannia Works, Huddersfield.—A leaflet on a new return trap.

Tungstone Accumulator Co., Ltd., 3, St. Bride's House, Salisbury Square, London, E.C.4.—A leaflet advertising "Tungstone" batteries.

Cochrane's (Middlesbrough) Foundry, Ltd., Middlesbrough. A stock list of cast iron and spun iron pipes.

Ozonair, Ltd., St. Leonard's Street, London, S.W.1.—A list describing the "Ozonelite" table standard.

Knightshades, Ltd., 36, Queensway, Ponders End.—A leaflet dealing with a new matched bedroom set.

A. Reyrolle & Co., Ltd. Hebburn-on-Tyne.—New pamphlets on protective gear, air-break switches, dividing boxes, indicators, switchboard instruments, and tallymeters and tallygraphs.

Bankruptcy Proceedings

A. E. L. Trebilcock, wireless dealer, trading as Lionel Trebilco, Holyrood Street, Chard, Somerset.—The public examination herein was held recently at Taunton. The statement of affairs showed liabilities of £349 and assets of £64, leaving a deficiency of £286. The debtor attributed his position to insufficient trade, competition, want of free capital, and ill-health. The examination was closed.

G. F. Smith (trading as G. H. Smith & Son), 23, Blossomgate, Ripon, Yorks, electrical engineer.—The public examination was held recently at Harrogate. The statement of affairs disclosed liabilities of £1,300 and a deficiency of £850. Debtor stated that in June, 1928, he commenced business on his own account with a capital of £100, which he invested in stock. He attributed his failure to the establishment of a Settle branch of his Ripon electrical contracting business and his inability to supervise both businesses. The examination was closed.

H. N. Wicks, trading as Harold Wicks & Co., Railway Hotel Buildings, Greenhithe, and 8, Stone Street, Gravesend, Kent, electrical specialist.—The public examination was held recently at Rochester, when the statement of affairs submitted disclosed a deficiency of £412. Debtor attributed his failure to insufficient working capital, heavy overhead charges, and error arising from opening a third establishment. The examination was closed.

H. Mortimer (trading as "Mortland Radio and Electric Co."), 4, Green Road, Leeds, radio dealer.—The public examination of this debtor was held recently at Leeds. There was a deficiency of £896. Debtor stated that in June of last year he commenced business in partnership with another. The partnership was dissolved in February last. The present position was attributed to lack of capital, bad trade, competition, and heavy expenses. The examination was adjourned for the production of certain accounts.

A. Fielding, 223, Whalley New Road, Blackburn, electrician and wireless dealer.—The public examination of this debtor was held on August 15th at Blackburn. The statement of affairs showed a deficiency of £83. Debtor stated that at first he made wireless sets in his spare time and gradually worked up a small business. In 1932 he extended the business to include that of an electrical engineer. He attributed his failure to shortage of capital, bad trade, and depreciation of stock and motor cars. The examination was closed.

R. E. Young, 8, Manchester Road, Swindon, wireless and electrical engineer.—Discharge granted August 15th subject to a suspension of six months.

D. G. Morris (trading as "Brymoor Radio Depot"), Sea View, Pembrey, Carmarthen, radio and electrical engineer.—First meeting held August 21st. Public examination, October 9th at the Guildhall, Carmarthen.

G. A. Glazebrook (trading as "Coventry Electrical and Wireless Supplies"), 27a, Victoria Street, Coventry, radio engineer.—The receiving order herein was made on the debtor's own petition recently. The statement of affairs shows liabilities of £392 against assets of £104, leaving a deficiency of £288. The position is attributed to "competition and bad debts."

H. Hillier-Brook, 13, Queen's Terrace, and 4, Market Street, Otley, Yorks, radio engineer.—Receiving order made August 10th on debtor's own petition. First meeting August 28th at 24, Bond Street, Leeds. Public examination October 9th at the County Court House, Albion Place, Leeds.

D. C. Hayes (trading at Birmingham as the "Streetsbrook Electrical Co."), 44, Burman Road, Shirley, Warwick, electrical contractor.—First meeting held August 23rd. Public examination, October 24th, at the Court House, Corporation Street, Birmingham.

G. E. Morris, 46a, Newcastle Avenue, Worksop, wireless dealer.—Liabilities of £157 and assets of £44 were disclosed when this debtor attended recently for his public examination which was closed at the County Court Hall, Sheffield.

J. C. Law, Alma Villa, Mark, Somerset, electrical and radio engineer.—First meeting held August 23rd. Public examination October 23rd at the Guildhall, Wells.

C. E. Tong, 11, Edgware Road, Fulford Road, York, electrical engineer.—First meeting held August 23rd. Public examination September 6th at the Law Courts, Clifford Street, York.

N. S. Nathan (trading in co-partnership as H. Entwistle & Co.), 306, Promenade, Blackpool, wireless dealer and electrical engineer.—Discharge suspended for four months; bankrupt to be discharged as from November 18th.

G. K. Gilchrist, "Coila," Derbe Road, St. Annes-on-the-Sea, electrical contractor.—Discharged as from July 24th.

E. S. Mellor, 12, Henry Street, Great Grimsby, electrical engineer.—Last day for receiving proofs for dividend August 29th. Trustee, Mr. J. F. Wintringham, Official Receiver, St. Mary's Chambers, Great Grimsby.

A. L. Pearce, 12, Fore Street, Newquay, electrical supplies dealer.—Last day for receiving proofs for dividend September 1st. Trustee, Mr. C. Hancock, Official Receiver, 12, Princes Street, Truro.

C. Doherty, electrical contractor, 28a, New Cannon Street, Manchester.—Receiving order made August 14th on debtor's own petition.

Company Liquidations

Mead Electric Co., Ltd., 58, Uxbridge Road, Ealing, W.5.—A meeting of creditors was held on August 14th in London, when Mr. Mead, a director of the company, was in the chair. It was reported that the liabilities amounted to £2,518, while the assets totalled £2,536. Mr. Mead explained that the present position had been brought about by insufficiency of capital. The company was formed in July, 1933, with a nominal capital of £2,000, of which £1,164 had been issued. In the first twelve months' trading there was a turnover of nearly £10,000, with a trading loss of £903. The assets had been taken at their book figures. A representative of an electrical firm stated that his clients were desirous of opening a branch, and were willing to buy the assets of the company, with the exception of the cash in hand and at bank, for £1,200, which sum it was estimated would provide a composition of 10s. in the £ for the unsecured creditors. The general opinion was that the liquidator and committee of creditors should have an opportunity of valuing the assets before the offer was considered, as the book debts and stock alone amounted to over £2,000. The offer was then withdrawn, but it was agreed that it should be re-submitted to the liquidator and committee appointed. Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, London, E.C., was appointed liquidator with a committee of inspection. The principal creditors are: J. A. Crabtree & Co., Ltd. (£51); Crompton-Kye Lamp Sales (£437); Callender's Cable & Construction Co., Ltd. (£68); Coldair, Ltd. (£71); Derby Cables, Ltd. (£70); Foster Engineering Co. (£86); General Electric Co., Ltd. (£50); W. T. Henley's Telegraph Works Co., Ltd. (£128); Johnson & Phillips, Ltd. (£213); Lighting Trades, Ltd. (£85); M.K. Electric, Ltd. (£90); Moulded Accessories Co. (£70); Simplex Electric Co., Ltd. (£125); and Walsall Conduits, Ltd. (£200).

C. B. Dickeson & Son, Ltd., wireless and electrical factors. 3, Tower Royal, Cannon Street, London, E.C.4.—At the statutory meeting of creditors on August 20th it was stated that the shareholders had passed a resolution nominating Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., as liquidator. A statement of affairs was submitted which disclosed liabilities of £4,113 and total assets of £1,732, leaving a deficiency of £2,381. The creditors confirmed the appointment of Mr. Osborne as liquidator with a committee of inspection. The following are the principal creditors:—General Electric Co., Ltd., £296; Siemens Electric Lamps & Supplies, Ltd., £286; E. K. Cole, Ltd., £231; Ferranti, Ltd., £194; Olde & Co., Ltd., £148; W. Dibben & Son, Ltd., £92; Ever Ready Co., Ltd., £91; A. C. Cossor, Ltd., £88; McMichael Radio, Ltd., £92; and British Electric Domestic Appliances, Ltd., £73.

Dicks Wireless & Electrical Factors, Ltd., 238, High Road, Kilburn, London, N.W.6.—Meetings of creditors and contributories will be held on August 28th at 33, Carey Street, Lincoln's Inn, London, W.C.2.

Cetex, Ltd., 19, Grosvenor Place, London, S.W.1.—Winding up voluntarily. A meeting of creditors was held on August 10th in London when the appointment of Mr. J. C. Day, 13-14, Little Britain, London, E.C.1, as liquidator, was confirmed, and Mr. S. S. Primost, 1a, Wood Street, London, E.C.1, was appointed joint liquidator to act with Mr. Day.

Lighthouse Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. L. Norman, 169, Regent Street, London, W.1, appointed June 25th.

Electricity Supply

Lighting, Domestic, Power

Annan.—ELECTRICITY FOR COUNCIL HOUSES.—The Town Council has decided to install electricity in the municipal houses now in course of erection.

Bolton.—EXTENSIONS.—The Corporation has obtained consent from the Electricity Commissioners to give a h.v. supply to the new Civic Centre, and has also received sanction to a loan of £50,000 for extensions.

Bridgend.—ELECTRICITY DEVELOPMENTS.—Important electricity developments in the Bridgend district of South Wales were discussed last week at a conference between members of the Central Electricity Board and Mr. R. Thomas, J.P. (chairman), and officials of the Bridgend Urban District Council. One of the chief items that came under review was a proposed scheme for the supplying of electricity to a number of villages in the vicinity of Bridgend, while a further matter was a decision on the part of the Council to rearrange its electricity charges with a view to effecting a reduction throughout the area under its administration.

Bulgaria.—ELECTRIFICATION SCHEME.—It is announced from Sofia that the Minister for Communications is having a plan prepared for the electrification of the country during a period of five years. The details of the scheme are shortly to be published.

Cannock (Staffs).—MAINS EXTENSIONS.—The Urban District Council has approved the extension of mains to the Foundry, Rugeley Road, Hednesford.

Chard.—EXTENSIONS.—The South Somerset & District Electric Co. is to extend mains at Wadeford and Wayford.

Chipping Norton.—PUBLIC LIGHTING CONTRACT.—The Town Council has accepted the contract of the Chipping Norton Electric Supply Co. for the street lighting during the winter months.

Dartford.—LOAN.—The Electricity Committee has obtained sanction to borrow £8,000 for mains, services, and meters.

SUPPLY EXTENSION.—The Committee is to provide an e.h.p. supply to a sub-station proposed to be erected at Crayford by the London Passenger Transport Board for the purpose of running trolley vehicles. The Board has agreed to lay the cable from the borough boundary to the proposed sub-station and the Corporation is to supply the cable and carry out the laying and reinstatement works in the borough, at an estimated cost of £1,500.

Dereham.—EXTENSIONS.—The extension of the electricity supply from Cemetery Road at a cost of £1,274 has been approved by the Urban District Council.

East Wemyss.—SUPPLY SUGGESTED.—Tenants at Glebe Park, East Wemyss, have asked the Fife Electric Power Co. to provide them with a supply of electricity. A cable will be laid if the demand is sufficient.

France.—A NATIONAL NETWORK.—The Minister for Public Works announces that his programme for the provision of work includes the establishment of an electricity network to cover the whole of France, with which all large sources of production will be connected. In the north of Paris it is intended to lay an underground cable for a pressure of 220,000 V. A great dam is to be constructed.

Germany.—POWER COMPANY'S JUBILEE.—The fiftieth anniversary of the foundation of the Berlin Städtische Elektricitäts-Gesellschaft, the semi-municipal concern which supplies the German capital with electric power, was celebrated recently. According to an article by Herr Rehmer in the *Zeitschrift des Vereines Deutscher Ingenieure*, the capacity of the generating plants of the undertaking has risen from 540 kW in 1884 to 802,500 kW at the close of 1933. During the same period the annual sales of power increased from 37,000 to 1,078,000,000 kWh.

Glasgow.—CHARGES AT STRATHCLYDE.—The request by the Glasgow Housing Committee for a reduction in the electricity charges of the Clyde Valley Electrical Power Co. and the Strathclyde Electricity Supply Co. is the subject of a letter by Mr. Hore-Belisha (Minister of Transport) to Mr. David Kirkwood, M.P. The Minister of Transport states, with reference to the Parliamentary question complaining that the company charged higher prices than the Corporation, that he has received a note from the company declaring that it has under consideration the possibility of reducing its charges. The Minister of Transport adds that it would be inadvisable for the Government to take any formal action pending the announcement of the company's decision to review its prices. With regard to the suggestion that the company's areas should be transferred to Glasgow Corporation, he points out that the Corporation is in a position to take over the distribution of the Strathclyde Co. when the present arrangements are reviewed.

Great Yarmouth.—REVISED CHARGES.—The Electricity Committee has approved the following recommendations of the borough electrical engineer for reduced charges (previous charges in parentheses): Lighting (flat rate) for all classes of consumers, 4½d. (5d.) per kWh; assessment charge for domestic premises, 10 per cent. (12½ per cent.), minimum 7s. 6d. (10s.) per quarter; "unit" charge to business premises, ¾d. (1d.), and for the outside areas, 1d. (1¼d.); power (flat rate),

the lower rate of 1¼d. per kWh to apply to consumptions of over 1,000 kWh per quarter instead of to over 6,000 kWh per quarter, and the 1d. rate to apply over 15,000 kWh per quarter instead of 20,000 kWh per quarter.

Holland.—ELECTRIC COOKING.—According to *L'Installateur*, of Paris, the Amsterdam section of the Dutch Association of Electric Power Distributors and the Dutch Association for the Development of the Use of Electricity have recently published the results of inquiries made of users of electricity for household purposes as to their opinion of electric cooking. To "What do you think of electric cooking generally?" 84 per cent. of the replies were "very good," 15.3 per cent. "good" and 0.7 per cent. "passable." "Does electric cooking require more or less attention than other forms?" To this, 74.1 per cent. of the responses were "less," 23.1 per cent. "just as much," 0.7 per cent. "more," no replies being received from the remaining 2.1 per cent. In answer to "Does electric cooking lighten your housekeeping task?" 87 per cent. replied "yes," 9 per cent. "no." "Do meals cooked electrically appear to you to be more appetising?" received 76.8 per cent. answers as "yes," 7 per cent. "no difference," 9.2 per cent. "no." To "Are you satisfied with the economy of electric cooking?" an answer of "yes" came from 95.4 per cent. of the users, "no" from 0.8 per cent. In reply to "Do you wish to return to the old form of cooking?" 96.5 per cent. answered "no," 0.8 per cent. "partly," while 2.7 per cent. did not reply.

Horncastle.—OVERHEAD LINES.—Following a public inquiry, the Minister of Transport has given his consent to the erection of overhead cables by the Mid-Lincolnshire Electricity Supply Co. in six roads at Horncastle.

Hove.—STREET-LIGHTING IMPROVEMENTS.—A new scheme of street lighting has been carried through, according to plans by the borough surveyor (Mr. T. R. Humble). The latest types of Holophane "Duo-Dome" refractors, symmetrical and directional types, have been installed in lanterns and attachments manufactured by the Brighton Lighting & Electrical Engineering Co., Ltd. In Kingsway, Hove, which in the past has been lighted with 300-W gas-filled lamps, "Duo-Dome" refractors have been used in conjunction with 500-W lamps. The improved lighting of the front extends well over two miles.

India.—ELECTRIC PUMPING SETS.—The proposal of the Government of the United Provinces (Agra and Oudh) to irrigate the land with electric pumping plant has proved practicable, and a sum of 312,000 rupees (£23,400) has been voted for the current financial year to cover the cost of pumping sets and the necessary cross-country conduits. The construction of sixty-nine installations, all in Meerut, has so far been definitely decided on at an outlay of 276,000 rupees (£20,700).

NEW DELHI.—A sum of 180,000 rupees (£13,500) has been advanced by the Indian Government to the Town Council to be spent in connection with the erection of a new power station.

Isle of Man.—ELECTRICITY BOARD'S REPORT.—The Electricity Board, which has been providing a supply since August 3rd last year, has issued a report for the period ended March 31st. The 33-V overhead-line system now comprises 71½ miles of main transmission lines conveying energy to thirty-four sub-stations. Twenty-three separate distributing networks have been established and approximately thirty-eight miles of distributors put into commission. The number of consumers actually in receipt of a supply on March 31st was 829. During the year the Laxey Electric Light & Power Co. was purchased at a cost of £1,815, and the Board now supplies the whole of the island with the exception of Douglas, which has its own municipal undertaking. Up to the present, few consumers have adopted the two-part tariff, but it is hoped that by means of efficient publicity and canvassing the number will be increased. The accounts show a gross profit of £1,422. The Manx Government gave £3,000, the first of five annual grants which have been promised, and thus the interest charges were met and two-thirds of the sinking fund, the remainder being suspended by permission of the Governor of the island. The engineer and secretary to the Board is Mr. J. P. Tucker.

Jugo-Slavia.—BOSNIA.—The installation of the new electrical power station at Zenica, Bosnia, is nearing completion. Construction of the station, which will be one of the biggest of its kind in South-Eastern Europe, was begun in 1931. It will supply industrial enterprises in the basin of the Zenica.

Lithuania.—ELECTRIFICATION PROPOSALS.—The Lithuanian Government is submitting to the State legislature an electrification programme, says a message to the *Deutsche Bergwerks Zeitung*, providing for the construction of a hydro-electric power station on the River Niemen, an auxiliary station near Ezerites, and a distributing system.—*Reuter's Trade Service.*

Littlemore (Oxford).—PERSISTENCE PAYS.—Every third year during the last twenty-four years a poll has been taken to decide whether a street-lighting system should be installed in the village. On Thursday last week, by a majority of 419 to 11, the voters decided, for the first time, in favour of street lighting. It is hoped to have a scheme of electric lighting ready for the coming winter.

Louth (Lincs).—NEW EQUIPMENT.—The Town Council has agreed to apply for sanction to a loan of £1,731 for transformers, switchgear, and a h.v. cable.

Nairn.—ELECTRIC LIGHTING.—The new electric light supply to the town was switched on last week. The principal streets are to be lighted by ten 100-W lamps and the side streets by nearly 200 75-W lamps. The General Electric Co., Ltd., supplied the necessary cable and fittings, and the installation was carried out by Edmundsons' Electricity Corporation, Ltd. The scheme was supervised by Mr. G. McLean, manager of the Inverness Electricity Department.

Newmarket.—CHEVELEY.—The Rural District Council is to ask the Bedfordshire, Cambridgeshire & Huntingdonshire Electricity Co. to extend its supply of electricity to Cheveley as soon as possible.

Northleach.—SUPPLY EXTENSIONS.—The Rural District Council has raised no objection to the erection of h.p. overhead lines to Rossley Manor and Lodge, Dowdeswell, by the Cheltenham Corporation.

Palestine.—HAIFA.—The Palestine Electric Corporation (the Rutenberg concern) is reported to be planning the erection of a large new power station, driven by Diesel engines, in Haifa. Dr. Rutenberg's journey to England is said to be connected with this project, in which the Iraq Petroleum Co. is taking an interest with a view to supplying oil in exchange for current.

Perth.—REDUCED CHARGES.—There is to be a reduction of 10 per cent. in charges for lighting, power, and heating, excluding public lighting, which will remain at the flat rate of ¾d. The rate for the railway companies is being reduced to the pre-war level of 1¾d.

Scarborough.—ELECTRIC STREET LIGHTING THROUGHOUT?—Mr. J. P. Watson, borough engineer, is to report generally to the Council on the matter of lighting all the streets by electricity.

A night photograph of the street lighting at Victoria Terrace, Hove

Silsoe (Bedford).—STREET LIGHTING.—Now that a supply of electricity is available from the Luton Corporation's mains, the Parish Council is to hold a meeting soon to consider the installation of electric street lighting.

Southend-on-Sea.—ARTISTIC ILLUMINATIONS.—Coincident with the opening of the ninth annual hospital carnival at Southend-on-Sea on Monday, Alderman R. Tweedy-Smith, J.P., Deputy-Mayor and chairman of the Electricity Committee, switched on an artistic scheme of illuminations, which will continue nightly until the second week in October. Over £800 has this year been spent on the decorative lighting. Approximately 130 flood lanterns are used in the coloured lighting of the Rock Gardens, the total power used being about 80 kW. The colours used on the trees are blue, violet, red, green, yellow, amber, and clear, in various effective shades, and a new departure is the illumination of large centre trees by "Imperial" dimmer flashers giving a continuous colour change. The area of illuminations has been considerably extended. In other parts hundreds of Chinese and decorative lanterns are employed, and churches and other prominent landmarks are floodlighted. Approximately 1,200 lamps in flame and ruby are used for a bower over the shrubbery on the "Hope" bastion. The work was carried out under the direction of Mr. A. C. Johnson, M.I.E.E., borough electrical engineer.

Strood.—OVERHEAD LINES.—The Rural District Council has decided to offer no objection to the Kent Electric Power Co., Ltd., extending the services by overhead lines at Pear Tree Lane, Shorne, and from Longfield Hill to Nurstead.

Sunderland.—OVERHEAD LINES.—The North-Eastern Electric Supply Co., Ltd., has applied to the Board of Trade for sanction to construct high-voltage electric cables over the River Wear from Herrington Burn to Washington and Herrington Burn to Dunston.

West Lancashire.—Inquiry.—It was reported at the West Lancashire Rural District Council that a letter had been received from the Electricity Commissioners stating that they intended to hold a public inquiry, as soon as possible after the autumn recess, into the application of the Lancashire Electric Power Co. and the Liverpool Corporation for orders to supply the townships of Downholland and Altcar.

Whitby.—Supply to Hawsker.—The Urban District Council is to canvass Hawsker to ascertain the probable number of electricity consumers if the cables were extended.

Traction

Brazil.—Railway Electrification.—It is announced from Rio de Janeiro that a credit of 2,500 contos of reis has been opened to meet the preliminary expenses in connection with the electrification of the Central Railway, particulars of which were given recently under this heading.

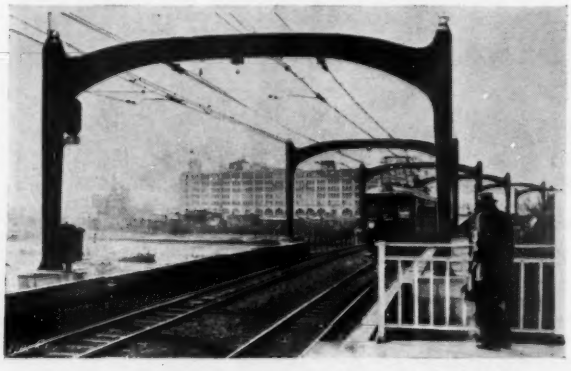
Diesel-electric Train.—A new Diesel-electric train has been placed in service on the Sao Paulo Railway. It is the first of its kind to be used in Brazil, and is capable of running at 110 km.p.h. Its general speed will be about 100 km.p.h., as the line is very much heavier than is usual where Diesel trains are in operation.

Edinburgh.—Electric Railway Signalling.—A resignalling scheme at Waverley Station, Edinburgh, is to be undertaken by the L. & N.E. Railway Co. Four signal-boxes are to be demolished, and in their place will be one cabin with a modern installation of power-signalling. There will be colour-light signals and alternating-current track circuits at the west end of the station.

France.—Electrically Hauled Traffic.—During 1933 the traffic over the 219 route-miles of electrified line belonging to the Paris-Orléans Railway Co. amounted to 6,440,000 train-miles and 3,350,000,000 trailing ton-miles, which form, respectively, 17 and 26 per cent. of the totals for the whole railway, although the electrified route-mileage is less than 5 per cent. of the whole.

Glasgow.—Tramway Extension.—The Transport Committee has decided to recommend to the Corporation to complete the tramway extension from Hillfoot to Milngavie. The Corporation has already spent £112,000 on the extension, and an additional expenditure of £3,000 would complete the work.

Hungary.—The Budapest-Vienna Railway.—The budget of the Hungarian State Railways for the year ending June 30th, 1935, contains an allowance of 2,750,000 pengos (approximately



[Asahi Photo

From time to time we have described the progress of railway electrification in Japan. The illustration shows one of the electric trains on a Tokyo suburban line

£162,000 at the present rate of exchange) for the completion of electrification of the 53-mile Komarom-Hegyeshalom section of the Budapest-Vienna main line. The 65-mile division from Budapest to Komarom was opened to electrification in September, 1932. Single-phase current at 15 kV, 50 cycles, is employed.

India.—Trolley-buses in Delhi.—A small fleet of twenty-seven four-wheel trolley-bus chassis has lately been completed by Guy Motors, Ltd., Wolverhampton, for the Delhi Electric Supply & Traction Co., Ltd. The chassis are fitted with 35-h.p. motors, and they are being equipped in India with twenty-seven-seater bus bodies designed by Guy Motors, Ltd.

Newcastle-on-Tyne.—Trolley-bus Proposal.—Tenders are shortly to be invited by the City Council for the supply of thirty-eight trolley-buses to operate on the Wallsend-Westgate Road route.

Portsmouth.—Unusual Trolley-bus Breakdown.—There was a serious dislocation of Portsmouth's new trolley-bus service last week when a bus overran its pole limit in London Road, Hilsea, and short-circuited the overhead wires. The trams, as well as the trolley-buses, were held up for an hour while repairs were effected. Similar accidents are unlikely to recur now that the drivers are becoming more accustomed to their new vehicles.

Russia.—The Suram Pass Line.—Operation of the Suram Pass line in the Caucasus over the two years since its conversion have shown that electrification has brought an annual saving of 736,000 roubles. The electrified section is forty miles long, and was converted owing to the difficulty of working heavy-oil trains down the long grades of 1 in 40. Two 120-ton locomotives with regenerative braking now hold a 2,900-ton train on the steepest grade.

Salford.—Buses to Replace Trams.—The Corporation tram service between Manchester, Swinton, and Pendlebury is to be replaced by buses on the section from Irlams-o'-the-Height on the Salford boundary to Swinton and Pendlebury.

South Africa.—Pretoria Municipal Transport.—The recent report of the town clerk and the electrical engineer, following their visit to England, was submitted to a sub-committee of the Trading Committee of the Pretoria City Council for consideration. The sub-committee recommends the substitution of omnibuses for trams as soon as possible on the Arcadia route.

Sunderland.—New Tramcars.—The English Electric Co. has supplied to the Town Council the first of the recently ordered luxury trams. The tram, which is to be put into immediate service, has a speed of 31 m.p.h. It holds 66 passengers—14 more than the ordinary car. It has a central entrance, and it is exceptionally long. The tram cost £3,000.

Traffic Signals.—The Glasgow Streets Committee has approved the erection of traffic signals in Kilmarnock Road at its junction with Newlands and Riverford Roads.

The Yarmouth Corporation is to consider the question of installing traffic signals at the junction of Beccles, Church and Burgh Roads.

The Notts County Council is to provide traffic signals at Beeston, Stapleford and Newark at a cost of £2,150.

Communications

Belgium.—New Broadcasting House.—The plans for a new Brussels broadcasting house have been approved, and the work of building it is to start next year. The station will move from its present site to the Place Ste. Croix in Ixelles, a suburb of Brussels. It will contain seventeen studios, one of which will accommodate an audience of 350. A sound laboratory will have the latest acoustic apparatus. Television equipment will be housed in a tower rising from one corner of the new building, together with the offices of the technical engineers.—*Reuter* (Brussels).

France.—Radio Receivers.—According to *World Radio*, there is a continued increase in the number of receiving sets declared, the latest figures being 1,572,991 at the end of May, 1934, compared with 1,554,295 at the end of April.

Radio Engineers' Association.—The Association Française des Radio-Electriciens has lately been organised in Paris, its objects being to establish a friendly and professional link between radio-telegraphic and telephonic engineers, and to develop and protect the interests of the engineers associated with all sections of the radio movement in France.

Germany.—Breslau Radio Station.—Work on the Breslau broadcasting station, necessary to increase its power from 60 kW to 100 kW, has begun, and programmes are being radiated by an auxiliary transmitter with an aerial power of 17 kW.

Great Britain.—Wireless on Trains.—The London and North-Eastern Railway Co. announces that 12,000 passengers using the East Coast route express have hired headphones to listen to broadcast programmes while travelling.

The New Long-wave Transmitter.—The new 150-kW Droitwich station, which is shortly to take the place of Daventry 5XX, is to commence regular transmissions for a few hours a day on September 6th. The Daventry transmitter, for nine years the principal British station, will cease broadcasting some time during October.

India.—Ceylon Telephone.—It is understood that the Colombo-Talaimanar land line of the Ceylon circuit will be completed by the end of November and that the actual communication between Ceylon and India will commence officially from January, 1935, while telephonic communication with the rest of the world will come into operation about a month later, reports our Bombay correspondent. In this matter Ceylon will be treated as part of India so far as telephone calls in other parts of the world are concerned.

Rangoon-Madras Communications.—The Indian Radio and Cable Communications Co., Ltd., of Bombay, has received a contract from the Government of India for the installation of equipment to provide short-wave telegraph and telephone communication between Rangoon and Madras. The installation will cost about £22,500.

Broadcasting from Peshawar.—Arrangements have been completed to start an experimental broadcasting service at Peshawar (North-West Frontier Province), where the studio and transmitter will be situated. Broadcasting will take place for two hours every evening to a number of villages within a radius of 25 miles.

Norway.—New Transmitter.—The new 20-kW station at Trøndelag has been put into service, and is using a wavelength of 476.9 metres.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Ardrossan.—August 31st. Town Council. Various works, including electric lighting for new houses. Specifications, &c., from, and tenders to, Joint Town Clerks, Burgh Chambers (deposit 10s. 6d.).

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 18th. Telephone receivers together with spare ear pieces, &c. (A.Y. 12501.)* Telephone switchboard cords. (A.Y. 12536.)*

September 25th. Telephone transmitters and parts. (A.Y. 12544.)*

October 17th. Victorian Railways. Selector telephone equipment consisting of a control office with thirteen radiating lines. (A.Y. 12532.)*

TOWNSVILLE.—October 11th. One 1,000-kW self-contained turbo-alternator unit complete with exciter auxiliary plant and all necessary instruments and fittings. A.Y. 12535.)*

Azores.—PONTA DELGADA.—November 5th. Municipal Council. Hydro-electric plant comprising Francis turbine, 3-phase alternator, oil-cooled transformer, switchgear, &c. (A.Y. 12504.)*

Barnes.—September 12th. Corporation. Traffic control signals. (August 10th.)

Brighton.—September 10th. Corporation. One 30,000-kW turbo-alternator with condensing plant and auxiliaries, and one 150,000-lb. steam-raising unit. (August 10th.)

Bristol.—September 7th. Electricity Department. Four 130,000-lb. steam-raising units. (August 3rd.)

Cheddleton.—September 10th. Mental Hospital Committee. Six months' supply of stores, including electric lamps. Mr. E. Lawton, clerk to the Hospital.

Chesterfield.—September 3rd. Public Assistance Committee. Electric lighting installation at the Institution. County architect, Derby (deposit £2 2s.).

Croydon.—September 5th. Town Council. Six months' supplies of stores, including electrical fittings and appliances, for Queen's Road Homes and other institutions. Town Clerk, Public Assistance Offices, Mayday Road, Thornton Heath.

September 3rd. Public Health Department. Six months' supply of stores, including electrical fittings and appliances, for the Mayday Hospital, Croydon Borough Hospital, Croydon Borough Sanatorium, and Coombe Cliff Convalescent Home. Medical Officer of Health, Town Hall.

Dalkeith.—September 1st. Town Council. Various works, including electrical, for 148 flatted houses. Specifications, &c., fromMorham & Brotchie, surveyors, 29, Hanover Street, Edinburgh; tenders to J. C. Sturrock, Town Clerk.

East Africa.—MOZAMBIQUE.—October 15th. Port and Railway Administration. Gas producer, motor, alternator, and distribution board. (G.Y. 14075.)*

East Dereham.—September 3rd. Electricity Department. Cable, e.h.p. sub-station switchgear, transformers, kiosks and switchgear, and l.p. overhead distributor lines. (August 17th.)

Egypt.—October 18th. Egyptian Government. Three complete electric pumping stations, with machinery and accessories at Fua, Balamoan and Serw. Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, S.W.1. (non-returnable deposit, £3 1s. 6d.).

CAIRO.—October 18th. Ministry of Public Works. Evacuating and dewatering pumps with electric motors, switchgear, main electric motors, accessories, switchgear and accessories, main and auxiliary transformers and accessories, oil for transformers and circuit-breakers, station electric lighting and equipment, and filter plant and accessories. (G.Y. 14151.)*

October 16th. Ministry of the Interior. Sub-station equipment, distribution and transmission lines for Tima. (A.Y. 12560.)*

Farnworth.—September 15th. Electricity Department. T.r. and v.i.r. cables for year ending August 31st, 1935. (See this issue.)

Hillingdon.—August 30th. Middlesex C.C. Public Assistance Department. X-ray equipment at County Hospital. (August 17th.)

Horwich.—September 10th. Electricity Department. Electrical materials. (See this issue.)

Hoylake.—August 31st. Urban District Council. Electrically driven centrifugal borehole pump. Water Engineer, Town Hall.

India.—SIMLA.—September 11th. Stores Department. Power station plant for Saidpore Power House. (A.Y. 12519.)*

Leeds.—September 15th. City Council. Boiler house equipment for Kirkstall power station extension. Particulars from Mr. C. Nelson Hefford, 1, Whitehall Road, Leeds (deposit £5). (August 17th.)

Lincoln.—September 10th. Electricity Department. P.i. and r.i. cables, cookers, joint boxes and shells, consumers' fuse boxes, network boxes and meters. (See this issue.)

London.—FULHAM.—September 4th. Borough Council. Wiring and modernising the electrical installation in the old portion of the Town Hall. (August 10th.)

DEPTFORD.—September 19th. Borough Council. Vehicle-actuated traffic signals at Lewisham High Road and New Cross Road. Particulars from Borough Engineer, Town Hall.

WEST HAM.—September 10th. Single-phase a.c. prepayment meters, transformers, and v.i.r. and t.r.s. wires and cables for twelve months ending September 30th, 1935. (See this issue.)

New Zealand.—WELLINGTON.—Post and Telegraph Department. October 10th. Telephone cable (A.Y. 12554)* (A.Y. 12555.)*

October 17th. 5,000 four-conductor and 500 six-conductor telephone instrument cords. (A.Y. 12553.)*

Oswestry.—August 31st. Electricity Department. Transformer, switchgear, cables and overhead distribution in connection with the Morda rural extension and transformer and h. and l.p. switchgear in connection with the Cross Market sub-station extension. (August 17th.)

Plympton St. Mary.—September 1st. Rural District Council. Supply and erection of h.v. switchgear, pole transformers, 6,300-V overhead lines, medium- and low-voltage overhead and underground distribution mains, &c., in connection with the extension of Tamerton and Roborough. Details from the electrical engineer, Council Offices, Plympton.

St. Helens.—September 4th. Electricity Department. H. and l.p. p.i. cables. (August 17th.)

August 30th. Transport Department. Eleven double-deck top covered four-wheel type trolley buses. Specifications and particulars from General Manager and Engineer, Corporation Transport, Hall Street; tenders to Town Clerk, Town Hall.

Salford.—August 29th. City Council. Twelve oil circuit-breakers and one lead-acid battery. (August 17th.)

Scarborough.—August 31st. Town Council. Electric lighting installations for 110 houses on the Prospect Mount housing estate. (See this issue.)

Sheffield.—September 18th. Electricity Department. Cooling towers and civil and constructional engineering work at Blackburn Meadows generating station, and civil and constructional engineering work at Neepsend power station. (August 3rd.)

South Africa.—PORT ELIZABETH.—September 17th. South African Railways and Harbours. Pumping equipment for Port Elizabeth Harbour. (G.Y. 14113.)*

PRETORIA.—September 21st. Union Tender and Supplies Board. Four stationary batteries. (A.Y. 12566.)*

JOHANNESBURG.—September 22nd. Municipality. Bare copper and weatherproof braided conductors. (A.Y. 12565.)*

Sunderland.—September 3rd. Electricity Department. Paper-insulated cable, rubber-insulated wire, meters and lamps. (August 3rd.)

Teddington.—August 30th. Commissioners of H.M. Works. Laying ducts and cables at the National Physical Laboratory. (August 17th.)

Wigtown.—September 10th. County Council. Various works, including electric tubing, at seventy-four houses. Specifications from R. G. Logan, county architect, Stranraer (deposit £1); tenders to County Clerk, County Buildings, Stranraer.

Willenhall.—September 3rd. U.D.C. Electric wiring of seventy-four houses at Bilston Lane. Plans, specifications, &c., from G. A. Waite, Town Hall (deposit £2 2s.); tenders to F. G. T. Webb, clerk, Town Hall.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aberdeen.—Housing Committee. Accepted. Electric lighting work at housing schemes (£1,378).—Stroud & Weir.

Cheshire.—Highways Committee. Accepted. Traffic signals at Northwich (£483).—Automatic Electric Co., Ltd.

Denny.—Accepted. Plant and cable for the electricity supply scheme (£1,000).—Morris & Son.

Dundee.—Markets Committee. Accepted. Electric lighting of section E of the slaughter houses (£311).—J. Mackersie & Co.

Glasgow.—Transport Committee. Accepted. Plugs and sockets.—A. Reyrolle & Co., Ltd. Telephone switchboard and cable.—Standard Telephones & Cables, Ltd. Fan motors for Pinkston.—Harland Engineering Co., Ltd. Sub-station switchgear.—Electric Construction Co., Ltd. Magnet coils.—Metropolitan-Vickers Electrical Co., Ltd.

Housing Committee. Recommended. Electrical installation at rehousing schemes, South Chester Street (£338) and Shuna Street (£1,062).—J. Edward.

Health Committee. Accepted. Electric lighting at Ruchill and Belvidere disinfecting stations (£198).—D. A. McLarty & Co.

Education Committee. Accepted. Electric welding plant for Stow College (£792).—Quasi-Arc Co., Ltd.

Great Yarmouth.—Electricity Committee. Accepted. Switchgear (£916).—A. Reyrolle & Co., Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during July:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Electric cable.—Anchor Cable Co.; Enfield Cable Works; Connollys.

Cells.—D.P. Battery Co.

Coils.—Marconi's.

Motors for cooling machinery.—W. H. Allen, Sons & Co.

Rotary convertor.—B.T.H.

Electrical equipment for h.p. air compressors.—W. H. Allen, Sons & Co.

Petrol-electric mobile crane.—Ransomes & Rapier. Sub-contractors for motors: Bull Motors.

Motors for seaplane lifting cranes.—Laurence, Scott & Electromotors.

Control gear for seaplane lifting cranes.—Allen West & Co.

Electrical equipment for oxy coal gas cutting and profiling machines.—Vidal Engng. Co.

All-electric drilling machine.—G. Swift & Sons. Sub-contractors for motors and control gear: Met.-Vick. Electl. Co.

Electric generating sets.—English Electric Co.

Dynamos for oil-driven generating sets.—W. H. Allen, Sons & Co.

Gearing and electrical equipment for drainage pump.—W. H. Allen, Sons & Co. Sub-contractors for switchgear: Watford Electrical Co.; for gearing: David Brown & Sons.

Electrical equipment for lathes.—Lancashire Dynamo & Crypto; B.T.H.
Domestic automatic refrigerators.—B.T.H.

WAR OFFICE.

Batteries and cells.—Britannia Batteries.
Electric cable.—Enfield Cable Works; Henley's.
Switchboards.—Ferguson, Pailin.
W.t. sets and parts.—W. Willis & Co.; Marconi's.

AIR MINISTRY.

Cooking apparatus.—G.E.C.
Electric fans.—Veritys.
Generators and brushes.—G. E. Mortley Sprague Co.
Engine speed indicators.—Record Electl. Co.
Morse keys.—Siemens Bros. & Co.
Switches and bases.—A. P. Lundberg & Sons.
Transmitter-receiver.—Marconi's.
Transmitters.—Standard Telephones.
W.t. valves.—G.E.C.

POST OFFICE.

Telegraph apparatus.—Creed & Co.; Power Equipment Co.
Telephonic apparatus.—Automatic Electric Co.; Baldwins; Thos. De La Rue & Co.; Ericsson Telephones; G.E.C.; Phœnix Telephone & Electric Works; Plessey Co.; Siemens Bros.; Standard Telephones; Telephone Mfg. Co.
Testing and protective apparatus.—Evershed & Vignoles.
Wireless apparatus.—Marconi's; Standard Telephones.
Terminal blocks.—Thos. De La Rue & Co.; Ebonestos Insulators.
Cable.—B. I. Cables; G.E.C.; Henley's; Pirelli's; Siemens Bros.; Standard Telephones; United Telephone Cables.
Secondary cells.—Britannia Batteries.
Loading coils.—Automatic Electric Co.; G.E.C.; Siemens Bros.; Standard Telephones.
Telephone cords.—B. I. Cables; London Elec. Wire Co. & Smiths; Phœnix Telephone & Electric Works; Reliance Elec. Wire Co.; Siemens Bros.
Power equipments.—Power Equipment Co.
Filters and filter cases.—Walter's Electl. Mfg. Co.
Electric lighting fittings.—Veritys.
Insulators.—Bullers; Thos. De La Rue; Doulton & Co.
Replating and enlarging batteries.—Edinburgh: Hart Accumulator Co.
Electric service lift.—London: Hoisting Appliance Co.
Telephone exchange equipment.—Boston, Pontypridd: Automatic Electric Co. Eltham: Automatic Electric Co. Sub-contractors: Alton Battery Co. for batteries; Electric Construction Co. for motor generators and ringing machines. Berwick-on-Tweed, Droylsden, Chorley, Loughborough, Chelmsford: Ericsson Telephones. Sub-contractors: Chloride Electrical Storage Co. for batteries; Electric Construction Co. for motor generators and ringing machines. Forest Hill: G.E.C. Sub-contractors: D. P. Battery Co. for batteries; Crompton Parkinson for motor generator; W. Jones & Co. for ringing machines. Penge: Siemens Bros. & Co. Sub-contractors: Hart Accumulator Co. for batteries; Electric Construction Co. for motor generators and ringing machines. Holymoorside: Siemens Bros. & Co. Chippenham, Erith: Standard Telephones.
Telephonic repeater equipment.—Birmingham: G.E.C. London, Leeds, Glasgow, Liverpool, Marks Tey, Newcastle-on-Tyne, Manchester: Standard Telephones.
Voice frequency telegraph equipment.—Grimsby, Manchester, London: Standard Telephones.

H.M. OFFICE OF WORKS.

Electric passenger lift.—London: Aldous & Campbell.
Storage battery and still.—Peking Legation: Chloride Electl. Storage Co.

CROWN AGENTS FOR THE COLONIES.

Aerial cable, poles, brackets, &c.—B. I. Cables.
Electric lighting fittings.—Osler & Faraday.
Electrically driven reciprocating pumps.—Hayward-Tyler & Co.
Radio broadcasting station.—Marconi's.
Superheater elements.—Superheater Co.
Switchgear spares.—B.T.H.
Telephone apparatus.—G.E.C.
Telephone cable.—Standard Telephones; Callender's Cable & Construction Co.
Train lighting spares.—Chloride Electl. Storage Co.

Kelso.—Accepted. Electric lighting at new Town Hall.—W. A. Smith & Co.

Wakefield.—Works Committee. Accepted. Traffic signals (£1,071).—Automatic Electric Co., Ltd.

Notes

The Grid Breakdown

The reference in our August 3rd issue to the electricity supply failure in the South-East and East England section of the grid on July 29th, which was based on information received from official sources, contained the statement that "one of the 35,000-kW turbines at Deptford stripped its blades." We are now asked to make it clear that the machine concerned was one of the 25,000-30,000 kW sets at the Deptford (West) station and not one of the three 35,000-kW Metropolitan-Vickers units, none of which broke down.

Conference of Women Engineers

A varied programme has been arranged for the twelfth annual conference of the Women's Engineering Society to be held at Norwich from September 21st to 23rd. On Friday, the 21st, at 7.30 p.m., Miss E. M. Kennedy will deliver her presidential address, following a reception. At 10 o'clock on Saturday morning a visit has been arranged to the Gothic Works of Messrs. Laurence, Scott & Electromotors, Ltd., and the day's programme also includes a civic welcome, a flying garden party at which Mrs. J. A. Mollison, C.B.E., is expected to be present, and the annual dinner. On Sunday a visit to Wroxham Broad takes place. Further details can be obtained from the hon. secretary, Miss C. Haslett, C.B.E., 20, Regent Street, London, S.W.1.

Alleged Tapping of Radio Relay Service

Edwin Thomas Giles, 5, Priory Road, Eastney, Portsmouth, was bound over last Friday at Portsmouth Police Court following a charge by the Hants Relay Co. that he had tapped a radio relay programme and interfered with the reception of sixty subscribers. The defendant said that he was not aware that a cable in front of his house belonged to the company and he had made use of it only as an aerial for testing his wireless set. A representative of the company said that as the defendant was unemployed the charge would not be pressed, but it was hoped that the case would be a warning to others.

Educational

The day department of the Regent Street Polytechnic School of Engineering reopens on September 18th, the entrance examinations commencing on September 4th, and the evening department reopening on September 24th. Particulars of the three-year diploma courses in mechanical, structural and electrical engineering are given in our advertisement pages.

Fatalities

The moving and re-erection of electric cables in an amateurish fashion was stated, at an Ollerton (Notts) inquest last week, to have resulted in the death of Cyril Kenneth Cooper (twenty-seven), a poultry farmer, of Cherry Tree Farm, Ollerton. According to evidence, Cooper used electric light in his fowl pens to increase the hours of "daylight." Last year he altered the positions of some of the pens and moved an electric cable. Part of the cable was hung over the wire netting of a pen. On August 14th he was found lying dead in the pen. The coroner (Mr. R. A. Daniel) remarked that the cable had been re-erected by Cooper in an amateurish fashion, and "live" wires had evidently come into contact with the netting. He hoped that the tragedy would be a warning to others not to move a cable without having it inspected by a competent person.

A schoolboy at Briton Ferry, South Wales, was killed when he climbed a tower on the moors near his home. At the inquest the West Glamorgan coroner said that it should be made impossible for anybody to climb pylons. He did not, think, however, that there had been any neglect on the part of the Central Electricity Board. Mr. T. B. Bowen, representing the C.E.B., said that this was the third case of its kind in the country.

An inquest was held at Kilburn last Friday on Miss Edith Norris, aged 60, of Beulah Hill, Upper Norwood, who was found dead in a bath at a house in Winchester Avenue, Brondesbury, where she was staying on a visit. It was stated that she was found lying face downward with her head against the brass taps. A "live" electric switch lay on the ledge by the side of the bath, and there were marks on her fingers as if she had touched the live pins at the end of the switch. A verdict of death from misadventure was returned.

Underwater Cables at Belfast

The illustration on page 247, reproduced from a photograph by Miss Whysall, draughter of Mr. F. H. Whysall, Belfast city electrical engineer, shows the laying of six 33-kV submarine cables and one 20-pair pilot and telephone cable across the Victoria Channel, Belfast, on August 12th. There are two crossings to be made, the second one being across the Herdman Channel. The cables crossing the channels are three-core 0.1 sq. in. screened type S.L. cable, having laid up in each of the three scores a 19/.064 galvanised steel strand, the whole armoured with a double layer of galvanised steel wires with one coat of compounded hessian between, the whole taped with one coat of compounded close mesh tape and two coats of compounded hessian tape overall. The whole of the seven drums of cable, representing a total weight of approximately 80 tons, was mounted on one barge, controlled by anchor ropes, and three tugs.

The total length of the crossing is 1,380ft. and the cables are buried in a trench 12 ft. deep below the channel bed, the trench being filled in to the original bed level. The total depth of the cables below harbour datum is 34ft. The cables were supplied and laid by W. T. Henley's Telegraph Works Co., Ltd., and the dredging of the cable trench was carried out by the Belfast Harbour Commissioners.

Appointments Vacant

Manager for the Walsall Electricity Supply Undertaking (salary £800, rising to £1,100).

Consumers' engineer for the County Borough of Southport.

Electrical engineer and manager for the Hazel Grove U.D.C. electricity supply undertaking (salary £600 per annum).

Assistant engineer and manager for the Alderley Edge and Wilmslow Electricity Board.

Charge engineer for the Electricity Department, Federated Malay States.

Technical officer for the Admiralty Technical Pool (Department of Scientific Research and Experiment, Admiralty) (salary £333, rising to £570).

(See our classified advertisements.)

Makers' Names Wanted

EXCELSIOR vacuum cleaner.
DELTA lamp.
SUNSHINE lamp.
VELOCETTE VACUETTE vacuum cleaner.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. H. J. Fisher, who has retired from the position of chief electrical engineer to the Lambton, Hetton & Joicey Collieries, Ltd., after twenty-nine years' service, has been presented by the officials and members of the electrical staff with a portable typewriter, a travelling case, and a brief case. The presentation was made on August 13th by Mr. J. W. Jackson, engineer to the North Eastern Electric Supply Co. Mr. Fisher is the new president of the Association of Mining Electrical Engineers.

Mr. David E. Lilienthal, director and administrative assistant, and **Mr. Llewellyn Evans,** chief electrical engineer, of the Tennessee Valley Authority, are reported by the *Daily Telegraph* to be coming to this country to study the grid system. The Tennessee Valley Authority is to undertake the distribution of power from the Muscle Shoals development. Messrs. Lilienthal and Evans landed at Queenstown on Tuesday, and were to inspect the Shannon scheme before coming to England.

Mr. G. A. Dalton, district electrical engineer for the South African Government Railways in the Cape, has been appointed constructional engineer in Natal. This is a new post created in consequence of a start being made on electrifying the remainder of the Natal main line.

Mr. J. L. Dixon has been appointed by the British Thomson-Houston Co., Ltd., Rugby, as manager of the London district and **Mr. C. G. Seeley** as assistant manager. Mr. Dixon was educated at Armstrong College, Newcastle-upon-Tyne, where he graduated in 1920 with the degree of B.Sc. (Electrical Engineering). A student apprenticeship course which he undertook at the Rugby works of B.T.H was interrupted by war service. During 1921-22 he was engaged in various sections of the company's Testing Department, and on turbine construction work in the London area. After a period in the Export Department he joined the London Office Export Department staff in 1924. During the past ten years he has devoted attention to export work at the London office, and one of the biggest contracts which he handled was that for the Uhl River hydro-electric scheme. Mr. Seeley joined the company's staff in 1903, following his early training at Finsbury Technical College and service with the Edison Swan Co., Messrs. J. W. Brook & Co., and the Norwich Corporation Electricity Department. He started in the Testing Department at Rugby and later became an assistant to Mr. Samuelson in the Turbine Department. In 1906 he went to Australia on behalf of the company, returning in 1909 to join the Public Works Department of the Government of Mysore as assistant engineer at the Cauvery Falls hydro-electric works. Towards the end of 1910 he was invited by the Australian General Electric Co. to return to Australia, where he eventually became manager of the Melbourne office and a director of the company. Except for an interval of four years with H.M. Forces and a further visit to England, he occupied this position for nearly twenty years until, in 1931, the interests of the I.G.E. and A.E.I. companies were combined to form the Associated General Electric Industries of Australia. Mr. Seeley then came to London as resident director of that company. He has now rejoined the B.T.H. Co. He is an associate member of the Institutions of Civil and Electrical Engineers.

Mr. J. L. Dixon [*Basil*

Mr. Clement Ludway Mullings, C.S.I., who was chief engineer of the Mettur Dam project, India, which was opened this week by the Governor of Madras (Sir George Stanley), has received the honour of knighthood in recognition of his work.

Dr. Rutenberg is visiting England in connection with a new power station, at Haifa, for the Palestine Electric Corporation.

Mr. F. F. Nicholson, late of the Majestic Electric Co., Ltd., has been appointed sales manager for the receivers and speakers Manufactured by Messrs. Midgley, Harmer, Ltd., Western Avenue, W.3.

Mr. A. J. Warner, who is in business as an electrical engineer at Chippenham, was married on August 6th, at Slaughterford, to Miss C. G. Little.

Major C. H. Brazel, M.C., A.M.I.E.E., who was recently appointed chief engineer and manager, Government Electrical Undertakings, Ceylon, has arrived in the island, according to *Indian Engineering*. Major Brazel was previously director of the Electrical Department, Bahamas.

Mr. C. H. Smith, chairman of the Midland Electric Manufacturing Co., Ltd., and a director of W. & T. Avery, Ltd., and W. Canning & Co., Ltd., has been appointed chairman of Thomas Smith's Stamping Works, Coventry.

We are glad to hear that **Mr. A. G. Beaver,** managing director of the Sun Electrical Co., Ltd., who recently underwent an operation, has now made a successful recovery and has resumed his business activities.

Mr. A. G. Beaver [*Haines*

Mr. R. T. Starr, who is on the staff of the Shropshire, Worcestershire & Staffs Electric Power Co., Ltd., at Abergavenny, was married on August 11th to Miss G. E. M. Usher. He was presented with an electric toaster by Mr. J. Shenton, S.W.S. representative at Abergavenny, and with an electric clock by the staff.

Mr. D. C. Apps, who for some considerable time has been Messrs. Berry, Wiggins & Co., Ltd.'s representative in the north for "Kingsnorth" electrical filling and sealing compounds, has been appointed to take charge, as from September 1st, of the southern territory formerly covered by the late Mr. J. Bastian. Mr. C. Bastian is to take over Mr. Apps's area.

Mr. R. J. Honniball, who has been mains engineer with the Weald Electricity Supply Co., Ltd., for about five years, and has taken up an appointment at Deal, was married at Hawkhurst on August 1st to Miss Eileen Pickering.

Obituary

Mr. G. Taylor.—The death occurred recently of Mr. George Taylor, a well-known Cowdenbeath electrician. Mr. Taylor became suddenly ill at the house of a friend, and died while being taken home. He was sixty-six years of age.

Prof. W. C. Clinton.—The death occurred on Saturday last of Prof. Wellesley Curram Clinton, Pender professor of electrical engineering at University College, London. Prof. Clinton, who lived at Highgate, London, N.6, first went to University College in 1894 as demonstrator in electrical engineering, being then in his early twenties. In 1899 he took his B.Sc. (London) degree with first-class honours, and in 1906 he was appointed assistant professor. He worked under Sir Ambrose Fleming for over thirty years. He joined the Institution of Electrical Engineers in 1896 and in 1912 he became a full member. The funeral was at Golders Green Crematorium on Wednesday.

Prof. W. C. Clinton

Mons. G. Cordier.—The death is reported from Paris at the age of sixty-nine of Mons. Gabriel Cordier, who had taken a prominent part in the development of hydro-electric power stations, electric traction and electro-metallurgy in France.

Mr. G. T. Cooper.—The death is announced, at the age of eighty-three, of Mr. George Thomas Cooper, of Catford, who was for fifty-three years with Messrs. Elliott Bros. (London), Ltd.

Mr. J. Towler.—The death is reported, at the age of seventy-six years, of Mr. John Towler, who had for many years been in business at Peterborough as an electrical engineer.

Mr. W. Bridger.—The death occurred on August 10th, after a brief illness, of Mr. William Bridger, A.K.C., B.Sc., M.I.E.E., of Kingston-on-Thames. Mr. Bridger was for many years chief lecturer in electrical engineering at the Municipal College, West Ham.

Mr. M. Nancarrow.—The death occurred recently, at the age of forty-seven, of Mr. M. Nancarrow, who for twenty years had held the position of electrician at New Lount

Colliery, Ashby-de-la-Zouch, Leicester. The funeral took place at Haltwistle Cemetery, Northumberland.

Col. G. R. C. Westropp.—The death occurred on Saturday last, in Devonshire, at the age of seventy-five years, of Col. George R. C. Westropp, a director of the Madras Electric Supply Corporation and Madras Electric Tramways, Ltd.

Wills.—Mr. M. Robinson, a former chairman of the Shirebrook Electric Supply Co., Ltd., left £23,634 (£9,087 net personalty).

The late **Mr. Thomas Swainson Bell,** electrical engineer, Whitehaven, left estate of the value of £6,835 (£6,792 net personalty).

World Radio Trade

THE German Institute for Economic Research, in the course of a long report on the world trade in wireless receiving sets, states that the turnover throughout the world only declined in value by about 6 per cent. in 1933 as compared with 34 per cent. in 1932. Of the eleven most important countries the exports amounted to 188 million Reichmarks (about £9.4 millions at par value) in 1933, as compared with 200 million marks (£10 millions) in 1932 and 301 million marks (£15.05 millions) in 1931. In considering these figures the Institute points out that as sale prices considerably diminished last year, it is very probable that the volume of the exports instead of having decreased, actually increased to some extent.

The European countries last year displayed a smaller absorbing capacity than in 1932, only Denmark, Ireland and Portugal having increased their imports. In the overseas markets, however, a number of countries, with the progressive extension of short-wave transmitting services in the world, considerably increased their imports, especially in South Africa, the Dutch East Indies, Australia, Egypt and Morocco.

The Institute states that, despite the most strenuous export propaganda, the German industry also lost ground in the past year. The exports only amounted to 66 per cent. of those in 1932, while the German share in the world exports declined from 22 per cent. in 1932 to 16 per cent. last year. It was only possible to obtain successful results in a few European countries, as for instance Italy and Portugal; in most of the others the exports declined. The losses were due to the fixing of low quotas, especially in France and Switzerland, high Customs duties as in Great Britain and Czechoslovakia or to the unfavourable economic situation in the countries concerned. In addition the unusually acute competition, especially of the American and Dutch industries, very perceptibly affected the German export trade.

The export trade of the United States is reported by the Institute to have been maintained at the value level of 1932, but the volume was considerably greater than in the preceding year. The depreciation of the dollar and the low prices asked by the American industry in the most important markets caused the average return per set to decline considerably. While the American industry obtained an average price of 106 Reichmarks (£5 6s.) per exported set in 1932, the average proceeds in 1933 were only 62 marks (£3 2s.); and the average proceeds per valve fell from 2.26 marks (2s. 3d.) in 1932 to 1.65 marks (1s. 8d.) in 1933. Holland gained ground in the world markets by means of active propaganda, especially in the Dutch East Indies, Argentina and Egypt, while increased exports went to Latvia, Portugal, Sweden and Ireland.

The Institute regards the prospects of the export trade to European countries as being still unfavourable owing to former buying countries having developed home industries which are protected by high duties, and to the existence of import quotas.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Firenheat, Ltd.—Private company. Registered August 16th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and sellers of patent fuels for use in electric radiators or other heating devices; manufacturers of electric radiators, &c. The first directors are: F. H. Smith, "Glen Innes," 95, Chinbrook Road, S.E.10, and W. E. R. Woodward, 58, Comeragh Road, W.14. Registered office: Buckingham House, Buckingham Street, Strand, W.C.2.

Passengers arriving at the principal Birmingham stations are now greeted by an example of the City Electric Supply Department's activities. At New Street Station a model of the type of cooker supplied on hire terms by the Department appears in a glass case (illustrated above), while at Snow Hill a large case containing two cookers is on view

Tolton Garage, Ltd.—Private company. Registered August 17th. Capital, £250 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, motor garage proprietors, motor engineers, &c. The directors are: A. Tolton, Harborough Road, Kibworth, Leics., and J. Brookes, 124, Mere Road, Leicester. Registered office: Harborough Road, Kibworth, Leics.

Clark Bros. (Wireless) Co., Ltd.—Private company. Registered August 16th. Capital, £2,000 in £1 shares. Objects: To adopt an agreement with C. N. Clark and R. Clark, and to carry on the business of manufacturers of and dealers in all kinds of television, telephone, wireless and cinematograph apparatus, &c. The permanent directors are: C. N. Clark, 255, Wellingborough Road, Rushden, and R. Clark, 40, Carnegie Street, Rushden. Registered office: 114, High Street, Rushden.

Shaw & Petrie (Radio), Ltd.—Private company. Registered in Edinburgh August 11th. Capital, £3,000 in 1,000 deferred and 2,000 ordinary shares of £1 each. Objects: To carry on the business of manufacturers, importers and exporters of, dealers in and agents for the sale and purchase of all kinds of electrical, musical and other instruments, &c. The first directors are: D. P. Shaw, 67, Arduthlie Road, Drumoyne, Glasgow, S.W.1, and two others. Registered office: 106/108, Polmadie Road, Glasgow, C.5.

Aurora Electric Heater Co., Ltd.—Private company. Registered August 16th. Capital, £1,000 in 800 ordinary shares of £1 and 4,000 founders' shares of 1s. each. Objects: To acquire certain inventions of H. B. Beer and M. H. Gazan for improvements in electrical heating elements and to carry on the business of electricians, electrical and mechanical engineers, manufacturers of and dealers in stoves, ironfounders, &c. The permanent directors are: C. F. Lumb, Ballard Coombs, Kingston Hill, Surrey, and two others. Registered office: 4, Cleveland Square, St. James's, S.W.1.

W. H. Smith & Co. (Electrical Engineers), Ltd.—Private company. Registered August 16th. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries, accumulators, wireless sets, &c. The directors are: W. H. Smith (permanent director and chairman), 53, Broadway, Failsworth, Lancs, and J. S. Urmston, 482, Lytham Road, Blackpool. Registered office: York House, 47, Fountain Street, Manchester, 2.

Treximport, Ltd.—Private company. Registered August 17th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical, chemical, electrochemical, electrolytic, and radio articles or apparatus, &c. The first directors are: I. Troostwijk, 50, Merstham Drive, Kingsbury, N.W.9; and H. Anholt, 24, Rotherwick Road, N.W.11.

Actadis, Ltd.—Private company. Registered August 15th. Capital, £5,000 in £1 shares. Objects: To acquire the trade mark "Actadis," registered in the name of the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, and to carry on the business of manufacturers of and dealers in all plant and equipment used in the manufacture, generation and distribution of electricity, gas and water, &c. The subscribers are: Hugh P. Barker, Vincent House, Vincent Square, S.W.1, engineer, and M. K. Hardway, 16, Old Broad Street, E.C.2, typist. Solicitors: Stephenson Harwood and Tatham, 16, Old Broad Street, E.C.2.

Henderson & Priestley, Ltd.—Private company. Registered August 15th. Capital, £5,000 in £1 shares. Objects: To acquire the business of electrical engineers and contractors carried on by R. W. Henderson and S. Priestley, at 4, Station Road, Sandiacre, Derby, as "Henderson & Priestley." The permanent directors are: R. W. Henderson, House Boat "Iris," Barton-in-Fabis, Nottingham, and S. Priestley, 171, Valley Road, Sherwood, Nottingham.

Ismay Zeros, Ltd.—Private company. Registered August 13th. Capital: £35,000 in 20,000 6½ per cent. first cumulative preference and 10,000 6½ per cent. second preference shares of £1 each and 60,000 "A" ordinary and 40,000 "B" ordinary of 1s. each. Objects: To carry on business as mechanical engineers, manufacturers of refrigerators and other machinery, plant and appliances for cooling or freezing food, liquids or other substances, &c., and to adopt an agreement with W. B. Normelli, J. Ismay, and J. Ismay & Sons, Ltd. The first directors are: W. B. Normelli, Huitakagard, Sweden, and J. Ismay, 10, Norwich Gardens, Ilford, Essex (director John Ismay & Sons, Ltd.). Registered office: Roden Street Works, Ilford, Essex.

Returns of Electrical Companies

United Ebonite Manufacturers, Ltd.—G. H. Robinson, Bassishaw House, Basinghall Street, E.C.2, was appointed receiver and manager on August 9th, 1934, under powers contained in debenture dated May 16th, 1929.

Central Electrical Engineers' Accessories Supply, Ltd.—Capital, £100 in £1 shares. Return dated April 7th, 1933 (filed April 3rd, 1934). All shares taken up. £100 paid. Mortgages and charges, nil.

Money Hicks, Ltd.—Capital, £500 in 475 preference shares of £1 and 500 ordinary shares of 1s. Return dated December 31st, 1933 (filed May 28th, 1934). 348 preference and 6 ordinary shares taken up. £330 6s. paid on 330 preference and 6 ordinary. Nil called upon 18 preference. Mortgages and charges, £1,000.

Excel Radio Units, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1933 (filed June 2nd, 1934). 301 shares taken up. £201 paid. £100 considered as paid. Mortgages and charges, nil.

Sphere Electric Instrument Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 10th, 1934. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Universal Lighting Co., Ltd.—Capital, £1,000 in £1 shares. Return dated April 29th, 1933 (filed April 9th, 1934). 290 shares taken up. £290 considered as paid. Mortgages and charges, nil.

Electro Trust, Ltd.—The nominal capital has been increased by the addition of £300,000 in £1 shares beyond the registered capital of £300,000. The resolution provides that the new shares, when fully paid up, shall be converted into cumulative preference and ordinary stock in the proportion of £6 preference to £4 ordinary; such preference stock to rank *pari passu* with existing preference stock except that dividend shall be at 5 per cent. in lieu of 6 per cent. per annum.

Kniveton Cable Works, Ltd.—Particulars filed of £1,000 debentures authorised April 5th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500 (on July 5th, 1934).

Ultrex Radio, Ltd.—Debenture dated July 24th, 1934, to secure £600, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: J. J. Hart, 13, Moyser Road, Streatham, S.W.

Yeldon (Radio), Ltd.—Particulars filed of debentures not exceeding £1,200, authorised July 19th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being issued on July 26th, 1934. Also debenture, dated July 26th, 1934, to secure £200, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: G. L. Coffin and J. L. Coffin, both of 250 and 258, Commercial Road, Portsmouth.

Gothic Electrical Supplies, Ltd.—Particulars filed of debentures not exceeding £10,000, authorised July 20th, 1934, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Globe & Simpson, Ltd.—Deposit on July 23rd, 1934, of deeds of certain freehold property in Sheffield, to secure all moneys due or to become due from the company to Williams Deacons Bank, Ltd.

A.S.E., Ltd.—The nominal capital has been increased by the addition of £250 in £1 ordinary shares beyond the registered capital of £500.

General Accessories Co., Ltd.—Satisfaction to the extent of £5,400 on July 16th, 1934, of trust deed dated January 4th, 1933, and registered January 17th, 1933, securing not more than £16,000 debenture stock.

Symondsbury Electric Lighting Co., Ltd.—Capital, £2,000 in £5 shares. Return dated April 14th, 1934. 244 shares taken up. £1,220 paid. Mortgages and charges nil.

George Moritz, Ltd.—Capital, £10,000 in £1 shares. Return dated March 8th (filed May 3rd), 1934. 9,081 shares taken up. £9 paid, £9,072 considered as paid. Mortgages and charges nil.

Metropolitan-Vickers Electrical Co., Ltd.—Capital, £250,000 in £1 shares. Return dated March 28th, 1934. 10,002 shares taken up. £10,002 paid. Mortgages and charges nil.

W. G. Hodgson & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated April 26th, 1934. 800 shares taken up. £400 paid, £400 considered as paid. Mortgages and charges nil.

Kent Bros. Electric Wire Co., Ltd.—Capital, £40,000 in 11,500 "A" ordinary, 3,500 "B" ordinary, and 25,000 preference shares of £1. Return dated April 3rd, 1934. 11,500 "A" ordinary, 2,300 "B" ordinary, and 25,000 preference shares taken up. £27,800 paid on 500 "A" ordinary, 2,300 "B" ordinary, and 25,000 preference shares, £11,000 considered as paid on 11,000 "A" ordinary shares. Mortgages and charges: £9,617.

City Notes

The British Power and Light Corporation (1929), Ltd.—An announcement in the *Times* states that the company has offered to acquire the holdings of ordinary shareholders of the North Wales Power Co., Ltd., by the issue of one fully paid ordinary £1 share for every two 10s. shares held. The ordinary shares to be issued in exchange will rank *pari passu* with the existing ordinary shares of the Power and Light Corporation as from April 1st, 1934.

United River Plate Telephone Co., Ltd.—The report for the past year shows a net profit of £636,103, as compared with £480,919 in 1932. It is proposed to pay a final dividend of 4 per cent. on the ordinary shares, making 7 per cent. for the year, against 5 per cent. for 1932. A balance of £499,300 is carried forward.

Waste Heat and Gas Electrical Generating Stations, Ltd., has announced an interim dividend of 2½ per cent. (same) payable on August 31st.

Cowans, Sheldon & Co., Ltd., report a net loss of £6,592 for the year to June 30th, compared with a net profit of £8,612 in 1932-33. The loss is deducted from the credit balance of £56,968 brought in, leaving £50,376. It is proposed to maintain the year's dividend of 5 per cent., £42,876 being carried forward. Meeting, August 28th.

The Compañia Hidro-Electrica de Tucuman.—The controlling company, Tucuman Tramways, Light and Power Co., is asking debenture holders to approve an agreement under which the company will be authorised to transfer to the Compañia de Electricidad del Norte Argentino S.A., the operation and management of the Compañia Hidro-Electrica's business, and the obligation to guarantee the service of its debentures. When the transfer is completed it is proposed that the Tucuman Tramways, Light & Power Co. shall go into voluntary liquidation and its assets shall be transferred, subject to its liabilities, to the Norte Argentino concern.

The Melbourne Electric Supply Co., Ltd.—The half-yearly 8 per cent. preference dividend will be paid on and after September 1st, subject to exchange and U.K. income-tax deductions.

The Adelaide Electric Co., Ltd., announces that the half-yearly 6 per cent. preference dividend will be paid at the Bank of Adelaide, London, on and after September 1st, subject to exchange and U.K. income-tax deductions.

Pifco, Ltd.—The annual meeting of the company will be held at Manchester on August 30th. An extraordinary meeting is to be held the same day for the purpose of considering resolutions increasing the capital to £50,000 by the creation of 25,000 £1 shares and to capitalise the reserves and distribute five new shares free for every six shares held.

The Rangoon Electric Tramways & Supply Co., Ltd., has announced an interim ordinary dividend of 6 annas per share, free of Indian income-tax (unchanged), payable on October 31st.

The North-Eastern Electric Supply Co., Ltd., announces an interim ordinary dividend of 2½ per cent. (same), payable on September 29th.

Stocks and Shares

TUESDAY EVENING.

THE general tendency round the Stock Exchange markets is very steady, though the dwindling of business due to the holiday season has the inevitable effect of causing prices to be a trifle heavy wherever a speculative account prevails. Mining shares, as well as industrials, have had a good long run of favour. It is surprising that prices keep up as well as they do, in view of the nominal apprehension in regard to the price of gold, and the cautious feeling that exists in respect of the nation's trade. We say "nominal" apprehension because, in spite of the fear which many people profess in regard to a possible falling off in the value of gold, some of these people are themselves amongst the buyers of gold shares at the present day. At the same time, the dislike which older investors entertain towards gold-mining shares accounts for a good deal of capital being directed into commercial and industrial issues.

The Gilt-Edged Group

London Passenger Transport A and B stocks show gains of 1½ and ¼ respectively. Central Electricity issues keep very firm. Gilt-edged securities are favourably influenced by a broad hint of Mr. Runciman to the effect that the income-tax might be slightly lowered—presumably in the next Budget. Doubtless the Central Board's engineers will take due precautions against the chance of another widespread breakdown occurring while the American visitors are upon their visit to see how the grid system works.

Cables and Wireless

Cables & Wireless stocks are better, all the three issues showing improvement. The index number for July is 68.9, which shows an increase of a little over 1 per cent., as compared with July last year, but goes against 70.1 a month ago. To those who are curious in such matters, an anomaly may be pointed out as existing between the prices of Cables & Wireless preference, and Globe Telegraph & Trust ordinary shares. Cables & Wireless is now paying 2½ per cent. on its cumulative preference stock; 2½ per cent. free of tax is being distributed by Globe Telegraph & Trust on the ordinary shares. If Cables & Wireless were able to resume the full preference

dividend, this would leave a balance, after payment of the preference dividend, of £163,000. A dividend of 7 per cent. free of tax on Globe ordinary requires £164,000, and, as the takings of Cables & Wireless expand, the amount available for dividend on Globe ordinary shares naturally increases, but to a greater extent.

The point is worth attention by holders of Cables & Wireless preference, who will find, upon consideration of the figures, that Globe ordinary shares are demonstrably cheaper than the former stock is.

Electricity Supply Shares

City of London ordinary shares have risen to 36s. 3d. and Metropolitans to 53s. 9d. For City of London 6 per cent. preference there is some demand at 31s. or a little higher. At this price the return on the money is £3 17s. per cent., a rate the acceptance of which can only be justified by reference to the gilt-edged character of the investment. It would be difficult, of course, to find anything throughout the Stock Exchange markets offering better security than that afforded by the prior-charge capital of the London electricity supply companies. The market in the shares, ordinary and preference alike, is unaffected by talk of energetic steps that are to be taken, after the holidays, to get prices reduced to consumers. The companies are no doubt well aware of any plans which are being made, and the fresh demand for cheaper electricity is not likely to come upon them with any sort of surprise.

Bournemouth and Poole ordinary strengthened to 78s. 9d., and Electrical Distribution of Yorkshire shares have advanced to 47s. 6d., these being the only changes in the group of provincial electricity supply companies.

Wireless Companies' Shares

The Radio Exhibition has served to quicken attention in the shares of the companies interested in wireless. Amongst these shares, Pye Radio stand out conspicuously, the shilling shares being quoted at 12s. 3d. On these, a dividend of 125 per cent. was paid for last year. E. K. Cole ordinary shares are of 5s. each, and are quoted at 11s. 3d. Another well-known wireless company is McMichael, Ltd., whose 5s. shares stand at 4s., the dividend of 8 per cent. having been regarded as disappointing. The company's £1 preference shares also receive 8 per cent., and are quoted about 16s. 3d., giving a yield on the money at that price of nearly 10 per cent. Lissen ordinary shares are held by the Ever-Ready Company, but there is a market in Lissen 8 per cent. preference, and the price stands about 24s. Telsen ordinary were introduced, it may be remembered, in the neighbourhood of 70s., fell like a stone below 20s., and now are quoted at 15s. Electrical & Musical Industries is closely associated with wireless, the company's £1 shares being about 27s. 9d. In these, there is a very free and active market, the shares being popular on both sides of the Atlantic. The price fluctuations are often very abrupt. This year, the shares have been down to 17s., and as high as 36s. 6d. Ferranti is another of the companies connected with the wireless industry in whose shares a Stock Exchange market obtains.

Dollar Stocks

The result of President Roosevelt's kaleidoscopic policy is reflected in Wall Street by complete stagnation of business. To this state of affairs contribution has also been made by the new measures for control of New York Stock Exchange operations by politicians at Washington. The Americans seem to have lost their taste for speculation, at any rate for the time being, for the amount of business being done in Wall Street is of the most meagre proportions. Here, in London, there is a certain amount of rushing about in the American market of the Stock Exchange when the cables come over at three o'clock giving the opening prices—10 a.m. in Wall Street. The excitement dies down in about twenty minutes, and, instead of Stock Exchange houses staying on for a street market, members go home at a reasonable hour; if orders arrive, they deal on the telephone from their private houses. The industrial news from Canada shows that trade conditions in that country are making headway, and prices of Canadian utility stocks and shares maintain noticeable firmness. Amongst dollar stocks an outstanding feature is the strength of Brazilian Tractions. The price has risen 1½ on the week, the buying being stimulated by the better traffics now being secured by the company.

There is also a vague impression abroad that the exchange position is getting better. This latter consideration was supposed to apply to the Argentine rate of exchange, but the Argentine companies are having a good deal of difficulty in the matter of remittances to this country. Anglo-Argentine Tramways 5 per cent. debenture stock at 5½ shows a gain of 2 points. Stock changed hands at 7 about a week ago.

Miscellaneous Matters

British Electric Traction preferred ordinary stock at 160½ has advanced 3 points. The company's deferred ordinary has gained 10 at 655, vying at one time with the Australians' first innings score in the Test Match. Tokyo Electrics at 78 have put on 10s. The rubber share market is harder. Business, while noticeably quiet, lies in the direction of absorption of floating supplies of shares. Dealers in the market admit that they are far from being overworked, yet, at the same time, that most of the public business is on the buying side.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Aug. 21.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole ...	1	15	15	78/9	+⅛	3 16 2
Brompton Ordinary ...	1	7	7	34/–	—	4 2 4
Charing Cross Ordinary ...	1	7	7	34/6	—	4 1 2
Chelsea	1	7	7	34/–	—	4 2 4
City of London	1	7½	7½	36/3	+⅛	4 2 9
Clyde Valley	1	7	7	39/6	—	3 10 9
County of London	1	10½	10½	57/6	—	3 13 1
Edmundson's 7% Pref.	1	7	7	34/6	—	4 1 2
Elec. Dis. Yorkshire	1	9	9	47/6	+6d.	3 15 9
Elec. Supply Corporation ...	1	11	11	3	—	3 13 4
Kensington Ordinary	1	7	7	34/–	—	4 2 4
Lancs Light and Power	1	7	7½	37/6	—	4 0 0
London Electric	1	7	7	34/–	—	4 2 4
Metropolitan	1	10	10	53/9	+⅛	3 14 6
Midland Counties	1	7	7	37/6	—	3 14 8
Mid. Elec. Power	1	8	8	43/9	—	3 13 2
North Eastern Electric Ordinary	1	6	6	33/–	—	3 12 10
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	53/–	—	3 15 4
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary ...	1	10	10	3⅛	—	3 5 3
Do. do. 6% Pref.	1	6	6	31/–	—	3 17 5
St. James' and Pall Mall ...	1	7	7½	35/–	—	4 5 9
Scottish Power	1	8	8	40/–	—	4 0 0
South London	1	7	7	36/–	—	3 17 9
Westminster Ordinary	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	—	7 2 10
Yorkshire Elec.	1	8	8	46/3	—	3 9 1
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	115	—	4 7 0
Do. 1955–75 ...	,,	5	5	118	—	4 4 0
Do. 1951–73 ...	,,	4½	4½	109	—	4 2 7
Do. 1963–03 ...	,,	—	3½	101	—	3 9 4
London & Home Counties, 1955–75	,,	4½	4½	108	—	4 3 4
London Passenger Transport, A...	,,	—	4½	120	+1½	3 15 0
Do. do. B...	,,	—	5	122½	+½	4 1 8
Do. do. C...	,,	—	3	80	—	3 15 0
West Midlands Joint Elec. 1948–68	,,	—	5	114	—	4 7 9
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	109½	+1	8 4 4
Anglo-Am. Tel. Pref.	Stock	6	6	112	—	5 7 2
Do. Def.	,,	1½	1½	27	—	5 11 1
Cables & Wireless 5½% Pref. ...	,,	2¾	2¾	70½	+1	3 18 0
Do. A. 7½% Ord.	,,	Nil	Nil	4	+1	—
Do. B. Ord.	,,	Nil	Nil	6¾	+½	—
Globe Tel. and T. Ord.	10	Nil	2½	8¼	—	2 17 6
Do. do. Pref.	10	6	6	12¼	—	4 18 0
Great Northern Tel.	10	20	20	35	—	5 14 4
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	3⅛	—	*3 15 3
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5½	+2	—
British Electric Traction Df. Ord.	,,	5	5	655	+10	—
Do. do. Pref. Ord.	,,	8	8	160½	+3	4 19 8
Brazil Traction	100	—	—	11¼	+1½	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds ...	—	5	5	22½	—	—
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	–3	—
Do. 1st Bonds	—	5	5	47½	—	10 10 6
Victoria Falls Ord.	1	15	20	6¾	—	3 1 6
Yorkshire (West Riding) ...	1	2½	5	25/9	—	3 17 8
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	10	55/–	+⅛	3 12 6
Assoc. Elec. Ord.	1	4	3	18/6	—	3 4 10
Do. Prf.	1	8	8	32/–	—	5 0 0
Babcock & Wilcox	1	9	6	44/–	—	2 14 7
British Aluminium Ord.	1	5	5	28/3	—	3 11 0
British Insulated Ord.	1	15	15	70/–	—	4 5 9
Brush Ord.	Stock	Nil	Nil	33	—	—
Callender's	1	15	15	3⅛	—	4 14 1
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord. ...	5/–	22½	12½	25/6	—	4 18 4
Do. 8% Pref.	1	8	8	33/9	—	4 14 10
Edison-Swan 1st Pref.	1	7½	7½	21/3	—	7 1 2
Do. 5% Deb.	Stock	5	5	107½	—	4 13 0
Electric Construction	1	Nil	Nil	10/–	—	—
Enfield Cable Ord.	1	25	20	85/–	—	4 14 1
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref. ...	1	Nil	Nil	9/6	—	—
Ever Ready	5/–	35	35	28/6	—	6 2 8
Ferranti Pref.	1	7	7	26/6	—	5 5 8
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	45/9	+9d.	3 9 11
Henley's	1	30	30	6½	—	4 17 8
Do. 4½% Pref.	5	4½	4½	5½	—	4 1 9
India-Rubber Preferred ...	1	—	—	18/9	—	—
Johnson & Phillips	1	5	5	22/–	—	4 11 0
Siemens Ord.	1	6½	4	17/6	+6d.	4 11 5
Telegraph Construction	£1	Nil	Nil	1	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and all subsequent proceedings will be taken.

1932

5989. "Coin-freed time-controlling mechanism for valves and electric switches." N. Hudson and Horstmann Gear Co., Ltd. March 29th, 1933. (414124.)

33384. "Thermionic valve holders." C. R. Cook. November 25th, 1932. (414057.)

1933

2031. "Photo-electric relays." British Thomson-Houston Co., Ltd. January 21st, 1932. (414102.)

2193. "Communication cables of high line attenuation." Siemens-Schuckertwerke Akt.-Ges. January 22nd, 1932. (Addition to 364008.) (414068.)

2328. "Electrical signalling systems." A. L. M. Sowerby and A. C. Cossor, Ltd. January 24th, 1933. (414048.)

2338. "Heavy-duty electric discharge rectifiers." Siemens-Schuckertwerke Akt.-Ges. January 28th, 1932. (414049.)

2560. "Telephone systems." Automatic Electric Co., Ltd., R. Taylor and J. A. Mason. January 26th, 1933. (Cognate application 16998-33.) (414106.)

2647. "Electrical 'in' and 'out' and like indicating devices." B. J. Farrow. January 27th, 1933. (414083.)

2743. "Electromagnetic regulating apparatus." J. Stone & Co., Ltd., and A. H. Chilton. January 28th, 1933. (414111.)

2749. "Electric carbon pile resistances." J. Stone & Co., Ltd., and A. H. Chilton. January 28th, 1933. (Divided application on 414111.) (414112.)

2809. "Electrical contacts." R. W. Young. January 30th, 1933. (414115.)

2899. "Submarine electric cables." Electrical Research Products, Inc. February 27th, 1932. (414119.)

2905. "Impulse-sending mechanisms for automatic telephone exchange systems and the like." Telefonaktiebolaget L. M. Ericsson and D. L. Lienzen. January 30th, 1933. (414120.)

3212. "Submarine electric signalling systems." Electrical Research Products, Inc. February 10th, 1932. (414134.)

3221. "Thermionic amplifiers." C. Lorenz Akt.-Ges. February 15th, 1932. (414135.)

3477. "Electric time fuses for use in blasting." K. Schaffler-Glossl. June 17th, 1932. (414147.)

6896. "Electrically operated windscreen wipers." B. Jablonsky. March 7th, 1933. (414162.)

8796. "Electric commutator motors." British Thomson-Houston Co., Ltd. March 25th, 1932. (414170.)

10202. "Electrostatic precipitating plant." Sturtevant Engineering Co., Ltd., and M. Gueilikman. April 5th, 1933. (414182.)

11200. "Miners' electric battery lamps." Concordia Electric Safety Lamp Co., Ltd., and T. Stretton. April 13th, 1933. (414190.)

11889. "Electron-discharge devices." Rogers Radio Tubes, Ltd. December 13th, 1932. (414193.)

15042. "Hot-cathode discharge tubes." General Electric Co., Ltd., and J. T. Randall. May 24th, 1933. (414201.)

17114. "Galvanic batteries." Oldham & Son, Ltd., and T. G. Mair. June 15th, 1933. (414203.)

20907. "Electromagnetic regulating apparatus." J. Stone & Co., Ltd., and A. H. Chilton. January 28th, 1933. (Divided application on 414111.) (414122.)

21814. "Telephone systems." A. Bohnenblust. August 5th, 1932. (414222.)

24489. "Thermionic valves." Marconi's Wireless Telegraph Co., Ltd. September 9th, 1932. (414227.)

24788. "Thermionic valves." R. M. Wise. September 10th, 1932. (414228.)

25644. "Insulating bushes for the terminals or other connections of electrical apparatus." Telegraph Condenser Co., Ltd., and P. A. Sporing. September 15th, 1933. (414232.)

27835. "Electric boiling or hot-plates." Revo Electric Co., Ltd., F. H. Reeves, and A. Crawford. October 10th, 1933. (414246.)

29648. "Method of, and arrangement for, obtaining the delayed initiation of occurrences in circuits for cathode-ray tubes." Radioakt.-Ges. D. S. Loewe and K. Schlesinger. October 27th, 1932. (414249.)

30080. "Thermionic valve circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. October 29th, 1932. (414251.)

32308. "Current transformer of coil type." Allmänna Svenska Elektriska Aktiebolaget. December 19th, 1932. (414261.)

33929. "Circuit arrangements for the selective reception and/or amplification of electrical oscillations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 12th, 1932. (414266.)

34445. "Dimming adapters for electric incandescent lamps." H. N. Soper, V. G. Knapp, and G. V. Wynne-Jones (trading as Vivian & Co.). December 7th, 1933. (414273.)

34826. "Light-flashing apparatus using electric discharge lamps." British Thomson-Houston Co., Ltd. December 23rd, 1932. (414278.)

35048. "Electric fires." Simplex Electric Co., Ltd., P. W. Davis, and J. J. H. Hunt. December 13th, 1933. (414280.)

35089. "Thermionic amplifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 26th, 1933. (414051.)

35723. "Alkaline electric accumulators of the nickel-iron type." Svenska Ackumulator Aktiebolaget Jungner. December 19th, 1932. (414286.)

1934

960. "Short-wave aerial systems." Compagnie Générale de Télégraphie sans Fil. January 11th, 1933. (Cognate application 961/34.) (414296.)

1684. "Interlocking arrangements for electric switches." C. A. T. Waldthausen. January 17th, 1934. (414298.)

3256. "Impulse-transmitting arrangements for use in telephone systems." P. Giordano. January 31st, 1934. (414301.)

6775. "Electrically heated wax pot for waxing threads." F. Meister, J. Adrian, sen., and J. Adrian, jun. (trading as Adrian & Busch). July 6th, 1933. (414314.)

8719. "Control systems for an electric elevator." Igranic Electric Co., Ltd. March 20th, 1933. (Addition to 6900/33.) (414323.)

13673. "Synchronous motors adapted for use in driving electric clocks and for other purposes." Muirhead & Co., Ltd., and F. H. Muirhead. January 24th, 1933. (Divided application on 2332/33.) (414052.)

19321/3. "Vacuum furnaces." H. Smethurst, F. E. Bancroft, G. Burrows and Associated Electrical Industries, Ltd. January 19th, 1933. (Divided application on 1814/33.) (414053/4.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned :—

August 8th.

Defiant (lettering and design). No. 551528. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester.

August 15th.

Plastape. No. 541647. Class 8. Wireless aerials, electric flexibles and electric cables in tape form.—Kenden, Ltd., 134, Pentonville Road, N.1.

Ferranti. No. 549143. Class 10. Electric clocks. No. 549144. Class 11. Electric accumulators and dry batteries, all for medical purposes.—Ferranti, Ltd., Hollinwood, Lancs.

Cascade. No. 552117. Class 13. Electric floodlighting lamps (ordinary).—St. James's Electrical Co., Ltd., 53, Victoria Street, Westminster, S.W.1.

Pylon. No. 550877. Class 13. Electrically heated kettles, saucepans, hot-water jugs, glue pots, coffee percolators and urns, smoothing irons, waffle irons, soldering irons and electrical connectors.—Premier Electric Heaters, Ltd., Premier Works, Keeley Street, Birmingham.

Econolite. No. 551589. Class 15. Lamp reflectors made of glass.—J. D. Carlmark, trading as the Sun-Lite Lamp Co., 10, Hardware Street, West Bromwich.

Plasmic. No. 551185. Class 50. Synthetic resin sold in solid form for industrial purposes.—J. P. Wagner, 54, Aldermanbury, E.C.2.

Styroflex. No. 551317. Class 50. Artificial resin in solid form for electrical insulating purposes, &c.—Norddeutsche Seekabel Gesellschaft, Oldenburg, Germany (British representatives: Marks & Clerk 57-58, Lincoln's Inn Fields, W.C.2).

Progress at Glasgow

THE Glasgow Electricity Department's accounts show that the gross revenue for the year ended May 31st last, amounted to £1,140,768, compared with £1,257,783 in the previous year. The working expenditure was £611,708 and a surplus of £87,842 (£134,982) has been transferred to the appropriation account.

The revenue account shows a decrease in income from all sources from the previous year's figures of £117,014, due to reductions in rates of charge. The working expenditure increased by £43,091, coal costs being up by £27,103. Changeover expenditure accounted for an addition of £39,988. The capacity of the plant installed at Dalmarnock generating station aggregates 137,500 kW; no additions or withdrawals having been carried out during the year. In all 278,311,000 kWh was generated at Dalmarnock, which is an increase of 64,194,100 kWh over the output for the previous year. 8,646,400 kWh was supplied to the grid of the Central Electricity Board. The energy purchased amounted to 38,199,451 kWh, a decrease of 19,388,207 on the previous year. During the year four 440-V sub-stations were put into commission and eight miles of high-voltage mains, 313 yards of low-voltage feeders, and 29 miles of distributor cables were installed. A standard frequency of 50 cycles is now operating throughout the whole area of supply. The following statistical information is of interest :—

Quantity of Electricity sold :—	Total kWh.	Average price per kWh.
Residential	50,659,685	1.15d.
Non-residential	80,454,163	1.44d.
Industrial power	125,666,316	0.70d.
Public street and stair lighting	10,881,309	0.75d.
Central Electricity Board	8,646,400	0.10d.

Net increase (excluding C.E.B.), 33,020,047 kWh. = 14.07%.

The amount sold is the largest yet recorded, and the falling off in sales during the previous three years, owing to trade depression, has been more than made up by the large increase this year. The cost per kWh sold was 0.3864d. for generation, distribution and management. The average cost of 0.9146d. per kWh sold is the lowest on record. The previous best was 1.0523d. for 1916-17. The amount sold per head of population was 267 kWh, and the maximum load on the system was 114,902 kW.

The load factor was 30.59 per cent.; the number of consumers connected 130,729; the apparatus installed on hire numbered 19,663; the motors connected totalled 176,482 h.p.; and hire-purchase installations totalled 39,022.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Houses (38), Caeffynnon; borough surveyor.
Ayr.—Houses (208), Lochside (£63,000); burgh surveyor.
Birmingham.—Houses (43), Stonehurst Estate; Hy. Dare & Son, Ltd., builders, Alum Rock Road, Ward End. Block of residential flats, Hagley Road, Edgbaston (£50,000); B. Whitehouse & Sons, builders, Monument Road. Additions to the Birmingham Dairy Co., James Watt Street (£40,000), with electrical work; W. J. Whittalls & Son, builders, Lancaster Street.
Bishop Auckland.—Houses (24); T. Manners, builder, Peel Street.
Blaydon-on-Tyne.—Houses (156), Hallgarth Estate; V. Mastaglis, surveyor.
Bromley.—Extensions, District Hospital (£20,000); P. Coad, architect, Nightingale Lane.
Bury.—Houses (28), Redvales Estate, Radcliffe Road; H. Wright, builder, Radcliffe Road.
Cardiff.—Premises, Allensbank Road; T. Elvet Llewellyn, architect. Estate development of North Road; Mountjoy, Ltd.
Catterick.—Additional quarters for the married officers (£17,000); G. Dougiel & Sons, builders, Chestnut Street, Darlington.
Cheadle (Staffs).—Public offices and Council chamber, Leek Road; R.D.C. surveyor.
Cheshire.—Primary school, Bebington; county architect.
Chesterfield.—Houses (100) and flats, Chesterfield Road, Eckington; W. L. Hind, architect, Trinity Buildings, Hanley, Staffs.
Consett.—Extensions to Secondary School; F. Willey, architect, 34, Old Elvet, Durham.
Coulsdon.—Development of Purley Estate; John Laing & Sons, Ltd.
Darlington.—School, Hundens (£24,181), for Borough E.C.; R. Blackett & Son, builders.
Dartford.—Houses (50), Brent Lane; W. J. Draper & Son. Houses (22), Priory Close; W. J. Brise. Swimming baths; borough engineer.
Daventry.—Houses (35), Weedon Beck; J. B. Williams, Moot Hall.
Dewsbury.—Houses (60), Dawgreen; borough engineer.
Doncaster.—Houses (30); R.D.C. surveyor.
Droylsden.—Houses (300), Clockhouse Estate; W. R. Parkinson, builder, Bindloss Chambers, 4, Chapel Walks, Manchester.
Dudley.—Houses (220), Priory Estate; F. H. Gibbons, architect, Priory Hall.
Durham.—Intermediate school, Easington Colliery, and additions, Bishop Auckland Grammar School; F. Willey, architect, 34, Old Elvet.
Fleetwood.—Residential hotel, the Promenade (£20,000); Halstead Best, architect, Blackpool.
Gateshead-on-Tyne.—Cinema and ballroom, Durham Road, for A. Smelt; E. M. Lawson, architect, 19, Ridley Place, Newcastle-on-Tyne. Extensions to Sheriff Hill Hospital; F. H. Patterson, borough engineer.
Glasgow.—Houses (102), Shettleton, 24 Cartvale, and 628 houses, Springfield; housing director and trade contractors. Cinema, Kilmarnock Road; H. C. & M. Winacour. Factory, Craigton Road; Melville, Dundas & Whitsun.
Gravesend.—Houses (201), West Court Farm Estate, Chalk; borough surveyor.
Grimsby.—School, Carr Lane, for E.C.; W. Wells, architect, Prudential Chambers, Victoria Street.
Guisborough (Yorks).—Houses (26), Gill Street, for F. Richardson.
Hampshire.—School (280 places), Farnborough, for County E.C.; director of education, Winchester.
Hanley.—Reconstruction of Grand Theatre (£50,000); J. Grant.
Heston and Isleworth.—Junior school, Sutton Lane, Hounslow; J. G. Carey, engineer, Council House, Hounslow.
High Wycombe.—Church, Sands; W. Hartley, builder, Wrexham, near Slough.
Hockley Heath.—School enlargement (£4,399); J. Kendall, Ltd., Tyseley.
Hull.—Telephone exchange, Kirkella, by direct labour; city engineer.
Hyde.—Houses (26), Knott Lane; Dean & Whipp. Houses (182), Woodfield Farm Estate; W. G. West, Stockport. Town hall extensions (£9,000); borough engineer.
Irish Free State.—(Charleville, Co. Cork).—Cottage hospital for the North Cork County Board of Public Assistance of County Home, Mallow; Board's architect, County Home, Mallow. (Kanturk, Co. Cork).—Nurses' quarters, district hospital, for the North Cork County Board of Public Assistance, of County Home, Mallow; Board's architect, County Home, Mallow.
Kent.—Junior school, Crayford, for County E.C. Enlargement to County Girls' School, Beckenham; county architect.
Keswick (Northumberland).—New mill for the Cumberland Pencil Co.; J. & R. Hodgson, builders, Stanger Street.
Lanarkshire.—Conversion of bank buildings into Library headquarters, Hamilton, for C.C. (£7,000); county architect, Hamilton.
Ledbury.—Cinema, Homend, for E. C. Lawton, Ryecroft, Bromesberrow (£15,000).
Leicester.—Houses (230), Victoria Road East; F. Craven, builder, Thornton Street, West Hartlepool.
Liverpool.—Houses (28), Burlington Street; director of housing, Dale Street. Houses (26), Castleview Road and Meadow Lane; Scarratt Bros., builders. Lingfield Grove.
London.—(Poplar).—Factory for Attomill, Ltd., Weston Street; S. B. Caulfield. New premises for Compton, Sons & Webb, Ltd., 404, 422, Old Ford Road; C. H. Lovegrove. (Stepney).—Houses, British Ropes site (Southern portion); Harry Barnes & Partners, 18, Abingdon Street, S.W.1.
Louth.—Houses (42); borough surveyor.
Margate.—Houses (37); borough surveyor.
Market Drayton.—Houses (28); U.D.C. surveyor.
Marlow.—Houses (26); Wallis & Co., builders.
Meir (Staffs).—Houses, Sandon Road; Workmen's Housing Association, Ltd.
Middlesbrough.—Houses (40), Glaisdale Avenue; N. Thompson, builder, Stonehouse Street, Linthorpe.
Nantwich.—Houses (26), for Mrs. G. Robinson, Yew Tree Farm, Wistaston.
Newburn-on-Tyne.—Houses (194), Throckley; R. Carse & Sons, builders, Morpeth.
Newcastle-on-Tyne.—Houses (170), Fergusons Lane Estate; Gustavus Bailey, Ltd., builders, South Shields.
North Riding.—Girls' High School, Sandybed, Scarborough, for County E.C. Extensions to Lady Lumley's grammar schools, Pickering, for County E.C.; F. Barraclough, assistant secretary, Northallerton.
Northumberland.—Schools, Longhirst, for County E.C. (£19,250); W. W. Tasker, county architect, 17, Claremount Place, Newcastle-on-Tyne.
Norton-on-Tees.—Houses (24); U.D.C. surveyor.
Nottinghamshire.—School enlargement, Church Street, Stapleford (£6,250), for County E.C.
Oldbury.—Houses (100); J. Lewis, builder, Redditch.
Oldham.—Houses (124) and bungalows, Roundthorne Housing Estate, and 88 houses on Hathershaw Housing Scheme; A. Chapman & Sons, Ltd., builders, Wadsley Bridge, Sheffield.
Paignton.—Estate development, Marldon Road; J. P. Rurse.
Preston.—Public baths, Saul Street; borough engineer.
Reading.—Houses (300), Basingstoke Road; First National Housing Trust, Ltd., 10, the Boltons, South Kensington, S.W.
Redditch.—Additions to the Smallwood Hospital (£30,000); H. Martin, architect, Corporation Street.
Rochdale.—Houses (152), Waithlands Estate, for the Proprietory Housing Investment, Ltd.; Thomas Wilkinson & Son, (Rochdale), Ltd., builders, Walpole Street.
Rugeley (Staffs).—Bazaar stores, Lower Brook Street, for F. W. Woolworth & Co., Ltd., London.
St. Helens.—Houses (196), Grange Park; borough engineer.
Salford.—Flats (300), for Sutton Dwellings Trust; H. S. Fairhurst & Son, architects, Brown Street, Manchester.
Sanderstead.—Houses (302), Limpsfield Road; J. Gerrard & Sons.
Scarborough.—Houses, Osgodby; H. Foster, Filey.
Selsdon (Surrey).—Twenty-four shops, Addington Road; A. D. Sanderson, Selsdon Park Hotel.
Shropshire.—Isolation hospital accommodation (£50,000), for C.C.
Sittingbourne.—Houses (24), Milton, for Norman & Clarke. Development of Billet Orchard Estate, London Road, for houses; W. Andrews.
Skipton.—Houses (104), Broughton Road; U.D.C. surveyor.
Southall.—Houses (122), Northolt Estate; Sudbury Estate Co., Ltd. Development of Featherstone Hall site; A. & B. Hanson, Ltd.
Southampton.—Girls' grammar school, Argyle Road, for Borough E.C.; director of education.
Spalding.—Houses (100), Bourne Road, for G. H. Hannam, Lumley Road, Skegness.
Staffordshire.—Senior boys' and girls' school (560 places), Sedgeley; director of education, Stafford.
Stoke-on-Trent.—Development of Longton Hall Estate; Wootten & Co.
Stranraer.—Houses (60); burgh surveyor.
Stretford.—Houses, Edge Lane; De Trafford Estates. Buildings, Texilose Road; English Texilose Co., Ltd.
Stroud.—Cinema (1,400 seats), for P. H. Haddock.
Sunderland.—Houses (64), High Southwick Estate; W. B. Cooper & Son, builders, Sans Street South.
Surbiton.—Hospital (£43,586), Hill Manor, Ewell Road, for Surbiton Hospital Committee; Thorogood Bros.
Swaffham.—Cinema, London Street, for the Swaffham Cinema Co., Ltd.; secretary.
Taunton.—Bazaar premises, Fore Street, for F. W. Woolworth & Co., Ltd., London.
Tipton.—Houses (600); U.D.C. surveyor.
Wakefield.—Houses (64), Horbury Road Estate; P. Morris, architect, Town Hall. Additions to Weatgate Common Mills, for A. Haley & Co., Ltd.; J. P. Firth, architect.
Walsall.—Houses (60); J. & T. Wootton, Ltd., builders, Bloxwich.
Warwickshire.—Two schools, Lynden End district, Solihull, for County E.C.
Wendover.—Houses (66), Aylesbury Road, for H. C. Janes, Ltd., Luton.
West Hartlepool.—Houses (32); Harland & Parker, builders, 202, York Road.
West Riding.—Mental hospital and admission block, Menston Hospital, Leeds, for the Mental Hospitals Board; clerk, Wakefield.
West Sussex.—Extensions, High School for Girls, Horsham (£11,350); county architect.
Whitby.—Houses (274) on the Gallows Close Estate; U.D.C. surveyor.
Whitley (Berks).—Houses (344); Gee, Walker & Slater, Ltd., Uttoxeter Old Road, Derby.
Woking.—Houses (36), Walton Road, for S. Kirby.
Wolverhampton.—Houses (104); borough surveyor.
Workington.—Houses (40), Reservoir Road, and additional houses, Frostam's site; J. Penman, borough surveyor.
Worthing. — Extensions, Worthing Hospital (£12,000); Governors.
Wrexham.—Houses (70), Spring Lodge Estate, and 26 houses at Banky Field; Lockwood, Abercrombie & Saxon, architects, Cathedral Chambers, Chester.
York.—Farm institute, Askham Bryan (£88,000), for the Yorkshire Council for Agricultural Education; secretary.